

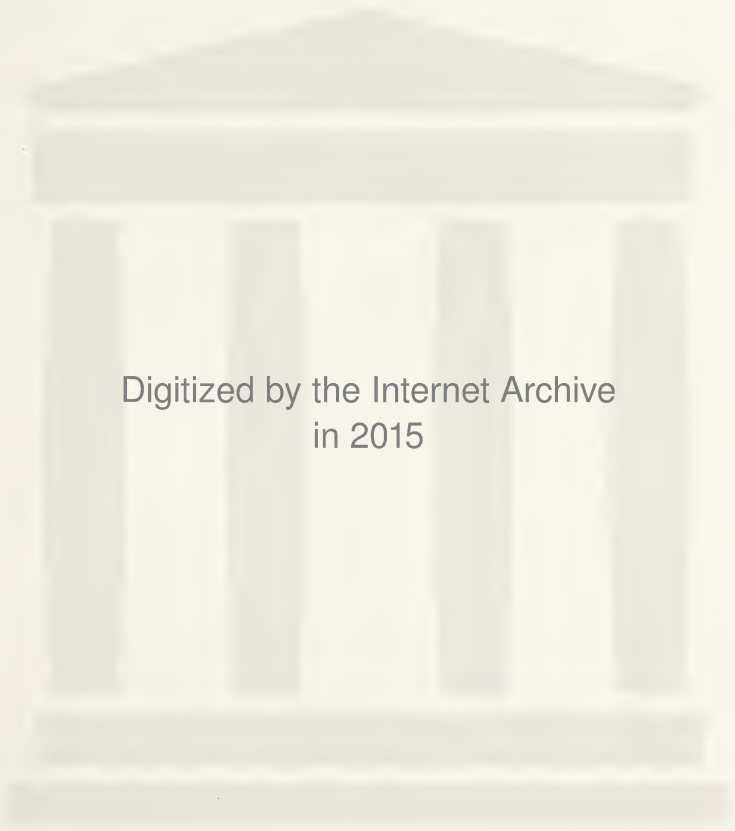












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# Blood Serum Vitamin A and Carotene Studies of Preadolescent Children



by  
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# Blood Serum Vitamin A and Carotene Studies of Preadolescent Children

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Although more than 25 years have elapsed since it was demonstrated that the animal body could convert carotene into vitamin A (9)<sup>1</sup>, how the conversion is accomplished is not known. There also remain unanswered questions concerning the metabolic role of these two nutrients in the human being and in the relationship between serum concentrations of vitamin A and carotene. Whether or not much of the carotene of the circulating blood can be converted into vitamin A is still undetermined.

Serum vitamin A levels have been said to be highly characteristic of the individual and less characteristic of vitamin A intake (4). Because of this and the difficulties inherent in the analytical methods, Caster and Mickelson challenged the reliability of serum levels of vitamin A as indicators of nutritional status. They suggested that the determination of serum carotene levels was the better procedure in vitamin A studies with humans. Conversely, the editor (10) of *Nutritional Status U.S.A.* has written that the serum vitamin A is the true criterion of vitamin A nutriture rather than serum carotene, which she considers to be only a measure of current carotene intake.

The Home Economics Research Division of Louisiana Agricultural Experiment Station has been studying the vitamin A and carotene serum levels of preadolescent children for the past 15 years. Even though the unsolved questions have not been answered, in view of the large sample that has been analyzed the findings relative to associations between these factors are considered pertinent and attention is focused on the complexities of vitamin A nutrition encountered.

## Purpose

This report is concerned with an evaluation of the nature and magnitude of variability of serum levels of vitamin A and carotene, and the relationship of these two nutrients in the blood to each other and to other factors. The immediate objectives of this study as described here were five:

1. To study the relationship of age, sex, season, and location of subjects among the four agricultural areas of Louisiana to the mean serum levels of vitamin A and carotene.

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<sup>1</sup>Italicized numbers in parentheses refer to literature cited.

2. To determine the associations between vitamin A concentrations and carotene concentrations in relation to several variables.
3. To characterize the magnitude of weekly variations encountered in a random sample of a survey group.
4. To define the number of samples which must be analyzed to yield reliable values.
5. To characterize the magnitude of individual variations encountered in selected groups of the same age and sex on controlled dietary regimens living under standardized conditions.

## Description of Sample

The seven experiments from which the data in this report have been drawn were of two types: surveys of nutritional status and carefully controlled metabolic balance studies.

Of the first type, three studies, designated as Experiments I to III, were included. These experiments were as follows:

*I. Nutritional Status of Louisiana Elementary School Children in the Four Agricultural Areas of the State.* This work was done in the years 1947 to 1949 and was limited to approximately 600 subjects ranging in age from 8 to 13 years (7, 8, 12). The number of subjects selected from each area was determined by the proportion of the elementary school population of the area to that of the entire state.

*II. Nutritional Status of Preadolescent Boys and Girls in Selected Areas of Louisiana.* (13). This study, conducted in 1950 and 1951, was limited to children 8 through 11 years of age, an equal distribution of boys and girls, and to at least 100 subjects from any chosen community. The schools in the five selected parishes varied in type and character from a small rural school in the bayou area to a large urban school in a choice residential area.

*III. Weekly Variations of Vitamin A and Carotene Concentration in Blood Serum of Preadolescent Children.* As a part of Experiment II, blood nutrient determinations were repeated at a weekly interval for 351 of the 552 children examined during 1950 and 1951 sessions. This was done to determine the variations in mean values obtained for a given group at two different dates as well as to determine the magnitude of individual subject variations within a weekly interval.

The metabolic studies, numbered IV to VII, were as follows:

*IV. Metabolic Studies with Preadolescent Girls: Utilization of Carotene.* (14). For six girls aged 8 to 11 years, a preliminary observation period of six weeks provided data concerning: (1) the subjects' normal intake of vitamin A and carotene and (2) serum levels of these nutrients on unrestricted dietary intakes. A controlled study for nine weeks provided information as to serum levels of vitamin A and carotene on a daily intake of 3,600 mcg. of beta-carotene in sweet potatoes as the sole source of vitamin A in the diet.

*V. Blood Serum Vitamin A and Carotene Concentrations of 11 Pre-*

*adolescent Girls on a Controlled Dietary Intake.* (3). The controlled diet of these 7- and 8-year-old girls met the National Research Council's recommended allowances (5) for all nutrients. Two-thirds of the vitamin A intake (3,850 I.U.) was derived from animal sources. The same diet was repeated every 4 days for the 64 days of the controlled study and blood samples were collected for each 4-day interval. The subjects lived under standardized conditions and close supervision in two groups of five and six each in two different locations. Five of the 11 subjects were Louisiana children.

*VI. Determination of Blood Serum Vitamin A and Carotene of 12 Preadolescent Girls on a Controlled Diet.* (15). The conditions of this study were very similar to those of Experiment V with the exception that all 12 girls were housed together and the vitamin A intake as calculated averaged 3,500 I. U. daily. The caloric and protein contents of the diets were adjusted to the weight of the subjects. There were four groups of three subjects each grouped according to weight. Louisiana participated in this experiment (16) and was solely responsible for the drawing of blood samples and all analyses for vitamin A and carotene. The children, however, were not housed in Louisiana, nor were they Louisianians.

*VII. Metabolic Patterns in Preadolescent Children: Effect of Low Protein on Serum Levels of Vitamin A and Carotene.* In 1958 the experiment was conducted to determine metabolic patterns when the dietary protein was reduced to less than 1 gm. per kg. body weight daily and when all other dietary constituents were held at the usual recommended levels (NRC) for 14 subjects 7 to 9 years of age. The diet as analyzed supplied 22.1 gm. of protein and 2,200 calories per subject per day. The vitamin A value of the diet as calculated was 2,687 I.U., 25 percent of which was derived from animal sources. Louisiana was again solely responsible for the vitamin A and carotene studies. The girls were housed and fed under the same conditions as those in Experiment VI.

## Procedure

### Methods for Vitamin Analyses

The detailed procedures for each of these experiments from which data were drawn have been described. Serum vitamin A and carotene were determined by the micro-chemical procedures (1) in every case with the exception of Experiment I. Here the macro-chemical method (6) was employed. In the survey studies, Experiments I to III, blood samples were taken between 9 a.m. and 12 noon without any attempt to obtain fasting blood samples. For the controlled metabolic studies fasting samples were drawn between 7 a.m. and 8 a.m. as the subjects arose. In each of the experiments all vitamin A and carotene determinations were made by one technician, thereby eliminating one source of variance.

The nutritional values of the diets were calculated with the use of the U.S.D.A. Agriculture Handbook Number 8 (18). For foods peculiar to this area, the nutritive value of the recipe was calculated on the basis of typical recipes obtained from the families. The mean nutritive intakes have been determined, described, and correlated with serum levels of specific nutrients (14, 3, 15).

### Statistical Methods

Correlation or association between observed factors in the studies is expressed by standard statistical methods (17). The coefficient of correlation was used to express the degree of relationship between serum vitamin A and carotene for each group and between each of these two nutrients and each variable included. The significance of the differences in serum concentrations of vitamin A and carotene in relation to the length of time the subjects consumed the controlled diets and the differences between the individual subjects' serum levels were determined by analyses of variance. For the weekly variations the analysis of variance was used to separate the variability of the vitamin A and carotene measurements into their separate components—that is, variability due to differences among subjects, between dates and that due to uncontrolled error of the biochemical analyses. On the basis of these data the number of subjects, times or replicates and duplicate analyses from a given sample needed to give valid results have been ascertained.

Tests for the significance of the differences between mean serum values for (a) all ages studied, (b) both sexes at each age level, and (c) the four areas within the state, were applied to the data from the survey groups.

## Findings and Discussions

In reporting the findings, the results along with the related discussions have been grouped into five divisions and will be given in the same order as was listed in the five objectives of this report.

### I. Serum Concentrations — Survey Groups

Mean serum concentrations of vitamin A and carotene in relation to age, sex, season and location within Louisiana are given in Tables I to VI. The distribution of these serum levels according to age and sex are presented in Tables III and IV. The mean values with ranges according to schools and the four agricultural areas within the state are listed in Table V. Seasonal variations are found in Table VI. Table VII shows the percentage distribution of Louisiana children according to classification by "Levels of Nutrition" (2) as indicated by serum vitamin A and carotene concentrations.

#### Age

The 959 children in the overall survey group (Table I & II) for whom values are given ranged in age from 8 to 13 years. In Experiment



TABLE I.—Mean Serum Vitamin A Concentrations of Louisiana School Children from 20 Elementary Schools

| Age | Experiment I |                      |       | Experiment II |                      |       | Experiments I and II |                      |       |
|-----|--------------|----------------------|-------|---------------|----------------------|-------|----------------------|----------------------|-------|
|     | No. Cases    | Mean<br>mcg./100 ml. | S. D. | No. Cases     | Mean<br>mcg./100 ml. | S. D. | No. Cases            | Mean<br>mcg./100 ml. | S. D. |
| 8   | 3            | 38.3                 | 9.4   | 119           | 36.8                 | 9.8   | 122                  | 36.3                 | 9.7   |
| 9   | 33           | 33.5                 | 17.0  | 140           | 38.0                 | 11.7  | 173                  | 36.6                 | 13.2  |
| 10  | 97           | 34.8                 | 18.0  | 131           | 36.9                 | 10.0  | 228                  | 35.7                 | 13.8  |
| 11  | 122          | 41.5                 | 17.0  | 135           | 38.0                 | 10.9  | 257                  | 39.3                 | 14.2  |
| 12  | 106          | 43.6                 | 17.5  | 0             | —                    | —     | 106                  | 43.6                 | 17.5  |
| 13  | 43           | 45.9                 | 16.0  | 0             | —                    | —     | 43                   | 45.9                 | 16.0  |
|     | —            | —                    | —     | —             | —                    | —     | —                    | —                    | —     |
| All | 404          | 40.4                 | 17.6  | 525           | 37.9                 | 10.2  | 929                  | 38.3                 | 13.9  |

TABLE II.—Mean Serum Carotene Concentrations of Louisiana School Children from 20 Elementary Schools

| Age | Experiment I |                      |       | Experiment II |                      |       | Experiments I and II |                      |       |
|-----|--------------|----------------------|-------|---------------|----------------------|-------|----------------------|----------------------|-------|
|     | No. Cases    | Mean<br>mcg./100 ml. | S. D. | No. Cases     | Mean<br>mcg./100 ml. | S. D. | No. Cases            | Mean<br>mcg./100 ml. | S. D. |
| 8   | 3            | 128.7                | 42.4  | 121           | 125.4                | 44.7  | 124                  | 126.8                | 50.1  |
| 9   | 35           | 115.6                | 59.9  | 135           | 131.6                | 43.2  | 170                  | 131.4                | 46.3  |
| 10  | 100          | 114.0                | 40.4  | 137           | 115.5                | 39.6  | 237                  | 114.8                | 40.1  |
| 11  | 131          | 98.3                 | 39.3  | 137           | 120.1                | 45.8  | 268                  | 109.5                | 44.1  |
| 12  | 113          | 100.7                | 37.6  | 0             | —                    | —     | 113                  | 100.7                | 37.6  |
| 13  | 47           | 99.2                 | 36.4  | 0             | —                    | —     | 47                   | 99.2                 | 36.4  |
|     | —            | —                    | —     | —             | —                    | —     | —                    | —                    | —     |
| All | 429          | 105.6                | 40.2  | 530           | 124.0                | 45.0  | 959                  | 115.2                | 44.5  |

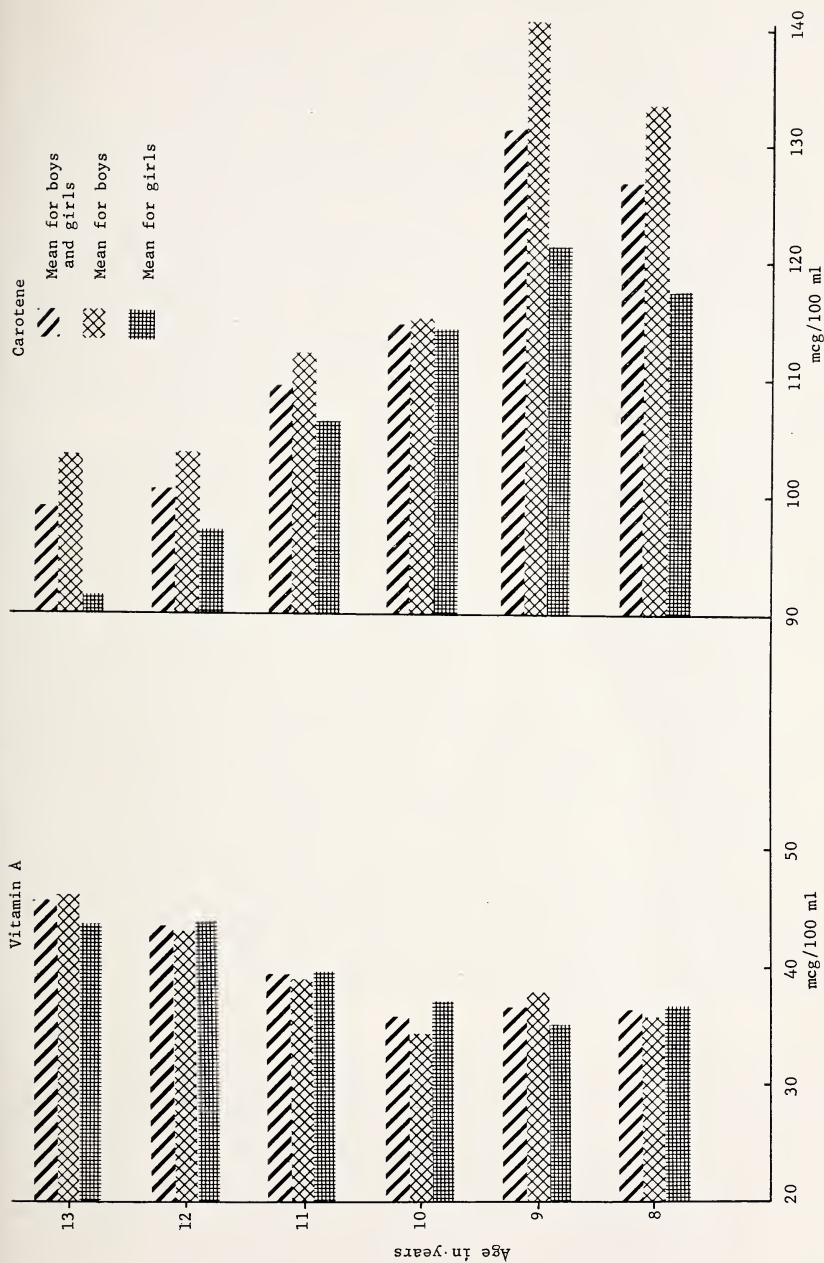


FIGURE 1.—Mean serum vitamin A and carotene values according to age and sex.



1 there were few 8-year-olds but children 12 and 13 years of age were included. Experiment II was limited to subjects 8 through 11 years, approximately 50 percent of which were 10 and 11 years of age. The 13-year-olds constituted slightly less than 5 percent of the total group.

The mean vitamin A for these groups increased with age from 36.3 mcg.% for the 8-year-olds to 45.9 mcg.% for the 13-year-olds (Table I). For carotene a converse trend was seen; the means dropped from 126.8 mcg.% for 8-year-olds to 99.2 mcg.% for the 13-year-olds (Table II). Tests for the significance of the difference between means for all ages proved that the mean serum vitamin A for the 12-year-olds was significantly higher than the means of 8-, 9-, and 10-year-olds and the mean serum level of vitamin A for the 13-year-olds was significantly higher than those for the 8-, 9-, 10-, and 11-year-olds. Similar tests applied to carotene concentrations showed the mean for the 8-year-olds was significantly higher than those from the 12- and 13-year-old groups (Figure 1).

Tables III and IV show the distributions by stated intervals of the serum values for these two nutrients, for both age and sex. Although the ranges are fairly wide (0 to 99 mcg.% for vitamin A and 23 to 414 mcg.% for carotene), the percentages in the upper and lower extremes were exceedingly small. A classification of the individual serum values in terms of "levels of nutrition," as suggested by Bessey and Lowry, placed over three-fourths of the subjects in or above the "good" level for vitamin A. Sixteen percent rated "fair" and approximately 8 percent "poor." The distribution of individual carotene serum values showed a smaller percentage in the higher levels, according to the same classification; 36.7 percent rated good, 46.1 percent, fair, and 17.2 percent, poor.

This trend was true not only for the group as a whole but for each age group (Table VII). Approximately 80 percent of the 12- and 13-year-olds had serum vitamin A values that rated "good" or better. For the 8-, 9-, 10-, and 11-year-olds, the percentages of each age group with "good" carotene levels ranged from approximately 55 percent for the 9-year-olds to 17 percent for the 12-year-olds. The differences in the percentages of each age group having high vitamin A levels were not as great as this.

## Sex

Five hundred four cases of the 959 carotene values reported were for males and the remaining 455 were for females. For vitamin A the distribution was even closer as there were 483 boys and 446 girls for whom serum values were obtained. The division between male and female subjects in each age group was approximately equal with the exceptions of the 13-year-olds and in vitamin A serum values for the 11-year-olds and in carotene values for the 8-year-olds. In the latter instances the number of male subjects was 16 and 25 percent greater than the females (Tables III and IV).

No statistically significant differences were found between the mean serum levels for boys and girls in any age group for either vitamin A

TABLE III.—Distribution of Serum Levels of Vitamin A According to Age and Sex

| Vitamin A<br>mcg./100 ml. | Subjects<br>No. | Percentage of Subjects with Various Serum Levels of Vitamin A |        |       |        |        |        |        |        |        |        |        |        |
|---------------------------|-----------------|---------------------------------------------------------------|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                           |                 | Age 8                                                         |        | Age 9 |        | Age 10 |        | Age 11 |        | Age 12 |        | Age 13 |        |
|                           |                 | Male                                                          | Female | Male  | Female | Male   | Female | Male   | Female | Male   | Female | Male   | Female |
|                           |                 | %                                                             | %      | %     | %      | %      | %      | %      | %      | %      | %      | %      | %      |
| 0-9                       | 30              | —                                                             | —      | 0.2   | 0.2    | 0.7    | 0.7    | 0.2    | 0.7    | 0.1    | 0.4    | 0.1    | —      |
| 10-19                     | 41              | 0.1                                                           | 0.1    | 0.5   | 0.4    | 0.8    | 0.7    | 0.7    | 0.1    | 0.7    | 0.2    | 0.1    | 0.1    |
| 20-29                     | 149             | 1.4                                                           | 1.3    | 1.2   | 2.8    | 2.6    | 1.4    | 1.9    | 2.1    | 0.5    | 0.3    | 0.2    | 0.3    |
| 30-39                     | 302             | 3.0                                                           | 3.0    | 2.9   | 2.2    | 4.7    | 4.2    | 6.0    | 4.3    | 0.9    | 0.9    | 0.3    | 0.1    |
| 40-49                     | 233             | 2.1                                                           | 1.3    | 3.2   | 2.8    | 1.7    | 3.9    | 3.3    | 2.4    | 1.5    | 1.4    | 0.8    | 0.1    |
| 50-59                     | 110             | 0.1                                                           | 0.4    | 1.0   | 0.9    | 1.5    | 0.9    | 1.5    | 2.2    | 1.4    | 1.3    | 0.5    | 0.2    |
| 60-69                     | 43              | 0.1                                                           | 0.1    | 0.1   | —      | 0.2    | 0.5    | 0.9    | 0.6    | 0.4    | 0.6    | 0.8    | 0.2    |
| 70-79                     | 18              | —                                                             | 0.1    | —     | —      | 0.1    | —      | 0.4    | 0.4    | 0.4    | 0.3    | —      | 0.1    |
| 80-89                     | 2               | —                                                             | —      | —     | 0.1    | —      | 0.1    | —      | —      | —      | —      | —      | —      |
| 90-99                     | 1               | —                                                             | —      | 0.1   | —      | —      | —      | —      | —      | —      | —      | —      | —      |
| Total No. of Cases        | 929             | 63                                                            | 59     | 86    | 87     | 114    | 114    | 139    | 118    | 55     | 51     | 26     | 17     |
| Mean Vitamin A            | 38.3            | 35.9                                                          | 36.7   | 38.0  | 35.3   | 34.3   | 37.0   | 39.0   | 39.7   | 43.2   | 43.9   | 46.4   | 43.9   |
| with S. D. $\pm$          | 13.9            | 8.8                                                           | 10.6   | 13.2  | 12.8   | 13.7   | 14.1   | 13.9   | 14.5   | 17.2   | 18.0   | 16.2   | 15.5   |
| Standard Error            |                 | 1.1                                                           | 1.4    | 1.4   | 1.4    | 1.3    | 1.3    | 1.2    | 1.3    | 2.3    | 2.5    | 3.2    | 3.8    |

TABLE IV.—Distribution of Serum Levels of Carotene According to Age and Sex

| Carotene           | Subjects |      | Percentage of Subjects with Various Serum Levels of Carotene |        |       |       |        |       |        |       |        |        |       |        | Age 13 |        |
|--------------------|----------|------|--------------------------------------------------------------|--------|-------|-------|--------|-------|--------|-------|--------|--------|-------|--------|--------|--------|
|                    |          |      | Age 8                                                        |        |       |       | Age 9  |       |        |       | Age 10 |        |       |        | Age 12 |        |
|                    | No.      | %    | Male                                                         | Female | %     | Male  | Female | Male  | Female | %     | Male   | Female | Male  | Female | Male   | Female |
| mg./100 ml.        |          |      |                                                              |        |       |       |        |       |        |       |        |        |       |        |        |        |
| 0-24               | 3        | 00.3 | 0.1                                                          | —      | —     | —     | —      | 0.1   | 0.1    | 0.1   | —      | —      | —     | —      | —      | —      |
| 25-49              | 15       | 01.5 | —                                                            | 0.1    | —     | —     | —      | 0.3   | 0.2    | 0.4   | 0.1    | 0.1    | 0.1   | 0.1    | 0.1    | —      |
| 50-74              | 148      | 15.4 | 0.6                                                          | 0.4    | 0.5   | 1.4   | 1.0    | 1.4   | 1.6    | 2.7   | 2.5    | 2.5    | 1.9   | 1.4    | 0.8    | 0.6    |
| 75-99              | 231      | 24.3 | 1.4                                                          | 1.7    | 1.4   | 2.0   | 2.0    | 3.4   | 2.8    | 3.7   | 3.7    | 3.7    | 3.2   | 2.1    | 0.5    | 0.4    |
| 100-124            | 210      | 21.8 | 1.4                                                          | 0.9    | 1.6   | 1.7   | 1.7    | 3.3   | 3.2    | 3.1   | 3.2    | 3.2    | 1.2   | 0.8    | 0.9    | 0.5    |
| 125-149            | 156      | 16.4 | 1.4                                                          | 1.5    | 2.0   | 2.3   | 1.5    | 1.5   | 2.1    | 1.9   | 1.3    | 1.3    | 1.0   | 0.9    | 0.3    | 0.2    |
| 150-174            | 110      | 11.6 | 1.3                                                          | 0.6    | 2.1   | 1.0   | 1.2    | 1.2   | 1.6    | 1.6   | 1.3    | 1.3    | 0.5   | 0.2    | —      | —      |
| 175-199            | 44       | 04.5 | 0.7                                                          | 0.1    | 0.6   | 0.5   | 0.5    | 1.0   | 0.4    | 0.2   | 0.7    | 0.2    | —     | —      | —      | —      |
| 200-224            | 28       | 02.8 | 0.5                                                          | 0.1    | 0.4   | 0.1   | 0.4    | 0.4   | 0.3    | 0.6   | 0.2    | —      | —     | 0.1    | 0.1    | —      |
| 225-250            | 7        | 00.7 | —                                                            | —      | —     | —     | 0.1    | 0.1   | —      | 0.3   | 0.1    | —      | 0.1   | —      | —      | —      |
| 250 and more       | 7        | 00.7 | 0.1                                                          | 0.1    | 0.3   | 0.1   | 0.1    | —     | —      | 0.1   | —      | —      | —     | —      | —      | —      |
| Total No. of Cases | 959      |      | 71                                                           | 53     | 85    | 85    | 85     | 120   | 117    | 139   | 129    | 59     | 59    | 54     | 30     | 17     |
| Mean Carotene      | 115.2    |      | 133.5                                                        | 117.7  | 141.5 | 141.5 | 121.4  | 115.3 | 114.4  | 112.4 | 106.3  | 103.9  | 103.9 | 97.2   | 103.7  | 91.4   |
| with S. D. $\pm$   | 44.5     |      | 55.6                                                         | 40.5   | 48.0  | 48.0  | 41.9   | 42.0  | 37.7   | 46.2  | 41.6   | 41.0   | 41.0  | 33.1   | 40.4   | 26.1   |
| Standard Error     |          |      | 6.6                                                          | 5.5    | 5.2   | 5.2   | 4.6    | 3.8   | 3.5    | 3.9   | 3.6    | 5.3    | 5.3   | 4.5    | 7.3    | 6.4    |

or carotene. Although not statistically significant, the males did have higher mean carotene concentrations than did the females for each age group, indicating a generally higher serum carotene concentration for the boys in this study (Figure 1).

### Agricultural Areas Within Louisiana

A wide variation in dietary patterns from one agricultural area of Louisiana to another has been observed and described (8, 7, 11). Because of these known differences in total food intake as well as sources of vitamin A and carotene, it was considered desirable to ascertain whether or not there were significant differences in the vitamin A status of children living among these areas and within the schools of an area.

Louisiana has been divided into four areas depending on the types of land and crops grown (Figure 2). Area A, the southeastern section, is known for its sugar plantations and truck farming, but also includes large urban and industrial areas. In Area B, the southwestern section, rice is the principal crop. The northern part of the state was divided into Area C, the Red River and Mississippi River Delta lands, and

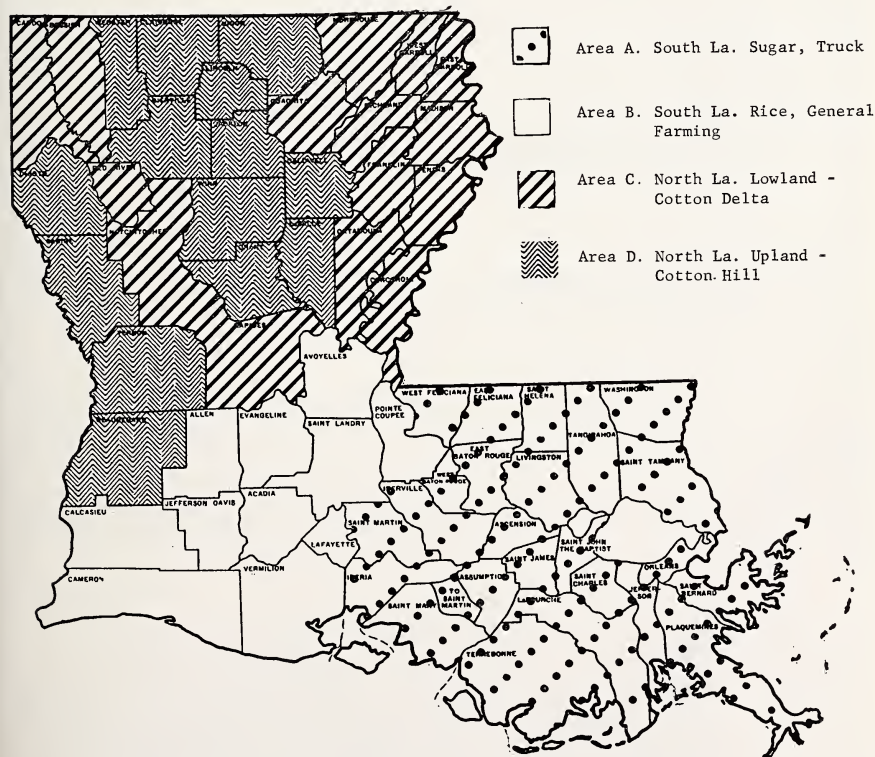


FIGURE 2.—Division of Louisiana according to types of farming.

TABLE V.—Mean Serum Levels of Vitamin A and Carotene According to School and Area

| Area-School              | Vitamin A |       |                       |                      | Carotene |          |       |                       |                      |      |
|--------------------------|-----------|-------|-----------------------|----------------------|----------|----------|-------|-----------------------|----------------------|------|
|                          | Subjects  |       | Range<br>mcg./100 ml. | Mean<br>mcg./100 ml. | S.D.     | Subjects |       | Range<br>mcg./100 ml. | Mean<br>mcg./100 ml. | S.D. |
|                          | No.       | %     |                       |                      |          | No.      | %     |                       |                      |      |
| A. Southeast Sugar-Truck |           |       |                       |                      |          |          |       |                       |                      |      |
| Breaux Bridge            | 33        | 3.6   | 0-76                  | 38.7                 |          | 38       | 4.0   | 47-245                | 100.1                |      |
| Covington                | 102       | 11.0  | 17-71                 | 38.6                 |          | 104      | 10.8  | 44-225                | 107.2                |      |
| Crescent                 | 73        | 7.8   | 16-73                 | 39.1                 |          | 78       | 8.1   | 66-256                | 126.1                |      |
| Dufrocq                  | 25        | 2.7   | 3-76                  | 48.5                 |          | 25       | 2.6   | 70-236                | 124.0                |      |
| Gentilly                 | 123       | 13.2  | 16-66                 | 36.3                 |          | 119      | 12.4  | 23-290                | 126.3                |      |
| Gumbel                   | 10        | 1.1   | 0-60                  | 28.5                 |          | 11       | 1.2   | 113-216               | 141.5                |      |
| Highland                 | 66        | 7.1   | 25-60                 | 40.9                 |          | 64       | 6.7   | 74-216                | 150.7                |      |
| L. S. U. Lab School      | 30        | 3.2   | 0-71                  | 36.5                 |          | 31       | 3.2   | 63-204                | 133.0                |      |
| Plaquemine               | 67        | 7.2   | 0-61                  | 33.6                 |          | 71       | 7.4   | 38-205                | 109.9                |      |
| Protestant Orphanage     | 2         | 0.2   | 0-17                  | 9.5                  |          | 2        | 0.2   | 111-169               | 137.0                |      |
| Woodlawn                 | 52        | 5.6   | 22-63                 | 34.3                 |          | 55       | 5.7   | 41-414                | 114.8                |      |
| Area Total               | 583       | 62.7  | 0-76                  | 37.6                 | 12.8     | 598      | 62.3  | 23-414                | 123.7                | 44.9 |
| B. Southwest Rice        |           |       |                       |                      |          |          |       |                       |                      |      |
| Bunkie                   | 34        | 3.7   | 0-70                  | 45.7                 |          | 37       | 3.9   | 43-213                | 103.2                |      |
| Marksville               | 25        | 2.7   | 16-89                 | 51.3                 |          | 27       | 2.8   | 49-167                | 92.6                 |      |
| Area Total               | 59        | 6.4   | 0-89                  | 48.1                 | 18.0     | 64       | 6.7   | 43-213                | 98.7                 | 36.5 |
| C. North Lowland         |           |       |                       |                      |          |          |       |                       |                      |      |
| Alexandria               | 10        | 1.1   | 0-52                  | 21.5                 |          | 10       | 1.0   | 103-198               | 144.5                |      |
| Bossier                  | 83        | 8.9   | 0-55                  | 31.6                 |          | 83       | 8.7   | 45-265                | 109.3                |      |
| Monroe                   | 12        | 1.3   | 15-65                 | 43.7                 |          | 13       | 1.4   | 51-89                 | 65.8                 |      |
| Winnsboro                | 51        | 5.5   | 2-67                  | 40.2                 |          | 51       | 5.3   | 46-205                | 90.9                 |      |
| Wisner                   | 30        | 3.2   | 8-69                  | 41.5                 |          | 33       | 3.4   | 19-163                | 62.1                 |      |
| Area Total               | 186       | 20.0  | 0-69                  | 35.8                 | 14.0     | 190      | 19.8  | 19-265                | 97.7                 | 41.7 |
| D. North Upland          |           |       |                       |                      |          |          |       |                       |                      |      |
| Ruston                   | 49        | 5.3   | 0-80                  | 42.3                 |          | 49       | 5.1   | 36-183                | 116.1                |      |
| Winnfield                | 52        | 5.6   | 8-71                  | 39.1                 |          | 58       | 6.1   | 33-228                | 102.9                |      |
| Area Total               | 101       | 10.9  | 0-80                  | 41.1                 | 7.5      | 107      | 11.2  | 33-228                | 109.0                | 36.3 |
| State Total              | 929       | 100.0 | 0-89                  | 38.3                 | 13.9     | 959      | 100.0 | 23-414                | 115.2                | 44.5 |



Area D, the upland area, in both of which cotton is the principal crop. An analysis of the diets of children in these areas has shown the intake of yellow and green vegetables to be lower in Area C and higher in Area D than the average for the state. The children in Areas A and C consumed larger quantities of margarine and butter than did the others. The consumption of milk was adequate in all areas. A striking difference in choice of cereal foods was noted. Rice was used most frequently in Areas B and C, grits and spaghetti in Area A and cornmeal in Area D.

The mean serum vitamin A concentrations of  $48.1 \pm 18.0$  mcg.% and  $41.1 \pm 7.5$  mcg.% for areas B and D, respectively, were significantly higher than those of  $37.6 \pm 12.8$  mcg.% for Area A and  $35.8 \pm 14$  mcg.% for Area C (Table V). The difference between the means of Areas B and D or between Areas A and C was not statistically significant. The mean serum carotene levels of subjects in Area A were significantly higher than those of all other areas. There were no other significant differences between the mean levels of serum carotene for the subjects among the other agricultural areas.

Before commenting upon the means for the different schools, it should be pointed out that 3.7 percent of the subjects in these survey studies were from four institutional homes for children. Children from these homes were attending public elementary schools in two areas, A and C. In area A the children were from two homes, Gumbel of New Orleans and Protestant Orphanage of Baton Rouge and are so listed. The other two groups of subjects, from The Baptist Children's Home of Monroe and The Masonic Home of Alexandria, were in Area C (Table V).

The mean serum vitamin A of 43.7 mcg.% for the children in the Baptist Home, Monroe, was above the state average of 38.3 mcg.%. The means for the other three groups were very much lower. With the exception of these three orphanage groups the mean serum concentration for each school group was above 30 mcg.%, which has been designated "good." Twelve of the 20 school groups had mean serum vitamin A above the state average.

The carotene values differed in trend from the vitamin A values in several schools. In the three orphanages with the low vitamin A serum levels, high serum carotene concentrations were found. Only four other school groups have values for carotene that rated "good," that is above 125 mcg.% (Table V).

### Season of Year

The examinations of the school children were conducted over the 9 months of the regular school year, that is from September through May. When the results from the individual schools were computed on the basis of fall (Sept., Oct., and Nov.), winter (Dec., Jan., and Feb.), and spring (March, April, and May), no real seasonal difference was seen for serum levels of vitamin A (Table VI). Although for fall the

TABLE VI.—Mean Serum Levels of Vitamin A and Carotene According to Season of Year

| Season<br>(Schools)       | Subjects |      | Vitamin A mcg./100 ml. |      |       | r.        | Carotene mcg./100 ml. |      |         |
|---------------------------|----------|------|------------------------|------|-------|-----------|-----------------------|------|---------|
|                           | No.      | %    | Mean                   | S.D. | Range |           | Mean                  | S.D. | Range   |
| Fall (Sept., Oct., Nov.)  |          |      |                        |      |       |           |                       |      |         |
| Crescent .....            | 73       | 7.8  | 40.3                   | 13.6 | 16-73 | 0.1934    | 124.1                 | 37.2 | 66-256  |
| Highland .....            | 66       | 7.1  | 42.3                   | 9.1  | 25-60 | 0.3786**  | 150.6                 | 34.9 | 74-216  |
| Masonic Home .....        | 10       | 1.1  | 22.0                   | 16.1 | 0-52  | -0.6868*  | 144.5                 | 31.8 | 103-198 |
| Gumbel Home .....         | 10       | 1.1  | 29.0                   | 17.5 | 0-60  | -0.4790   | 144.5                 | 27.5 | 113-216 |
| Protestant Orphanage ..   | 2        | 0.2  | 10.0                   | 5.0  | 0-17  | -1.0000** | 137.0                 | 25.0 | 111-169 |
| Fall                      | 161      | 17.3 | 37.59                  |      | 0-73  |           | 135.49                |      | 66-256  |
| Winter (Dec., Jan., Feb.) |          |      |                        |      |       |           |                       |      |         |
| Baptist Children's Home   | 12       | 1.3  | 44.1                   | 16.5 | 15-65 | -0.6520*  | 66.0                  | 9.3  | 51-89   |
| Breaux Bridge .....       | 33       | 3.6  | 40.8                   | 18.9 | 0-76  | -0.7211** | 103.0                 | 44.7 | 47-245  |
| Gentilly .....            | 111      | 13.2 | 39.8                   | 7.9  | 16-66 | 0.3290**  | 128.0                 | 33.8 | 23-290  |
| L.S.U. Laboratory .....   | 30       | 3.2  | 37.7                   | 15.7 | 0-71  | -0.9803** | 132.0                 | 37.0 | 63-204  |
| Woodlawn .....            | 52       | 5.6  | 35.6                   | 9.9  | 22-63 | 0.2994*   | 139.4                 | 67.0 | 41-414  |
| Winnshoro .....           | 51       | 5.5  | 40.7                   | 13.0 | 2-67  | -0.5917** | 91.4                  | 38.2 | 46-205  |
| Wisner .....              | 30       | 3.2  | 42.0                   | 15.7 | 8-69  | -0.7580** | 78.2                  | 33.8 | 19-163  |
| Winter                    | 319      | 35.6 | 39.51                  |      | 0-76  |           | 115.22                |      | 19-414  |
| Spring (Mar., Apr., May)  |          |      |                        |      |       |           |                       |      |         |
| Bossier .....             | 62       | 6.9  | 32.6                   | 10.1 | 0-55  | 0.3581**  | 109.2                 | 44.9 | 45-265  |
| Bunkie .....              | 34       | 3.7  | 46.2                   | 17.2 | 0-70  | -0.5486** | 103.9                 | 34.7 | 43-213  |
| Covington .....           | 99       | 11.0 | 39.4                   | 9.2  | 17-71 | 0.4982**  | 106.2                 | 40.1 | 44-225  |
| Dufrocq .....             | 25       | 2.7  | 49.0                   | 18.1 | 3-76  | -0.4322*  | 124.0                 | 41.9 | 70-236  |
| Marksville .....          | 25       | 2.7  | 51.8                   | 18.7 | 16-89 | -0.4803*  | 93.0                  | 36.2 | 49-167  |
| (                         | 41       |      | 29.1                   | 16.4 | 0-65  | -0.2065   | 107.7                 | 34.4 | 37-212  |
| Plaquemine .....          | (        | 7.2  | 39.8                   | 7.9  | 25-55 | 0.0874    | 117.6                 | 33.8 | 25-187  |
| Ruston .....              | 49       | 5.3  | 42.8                   | 16.9 | 0-80  | 0.1928    | 116.1                 | 37.2 | 36-183  |
| Winnfield .....           | 52       | 5.6  | 40.6                   | 13.7 | 8-71  | -0.7343** | 103.8                 | 35.6 | 33-228  |
| Spring                    | 414      | 45.1 | 39.83                  |      | 0-89  |           | 108.1                 |      | 25-265  |
| TOTAL .....               | 894      |      |                        |      |       |           |                       |      |         |

\*Significant at the 5 percent level

\*\*Significant at the 1 percent level

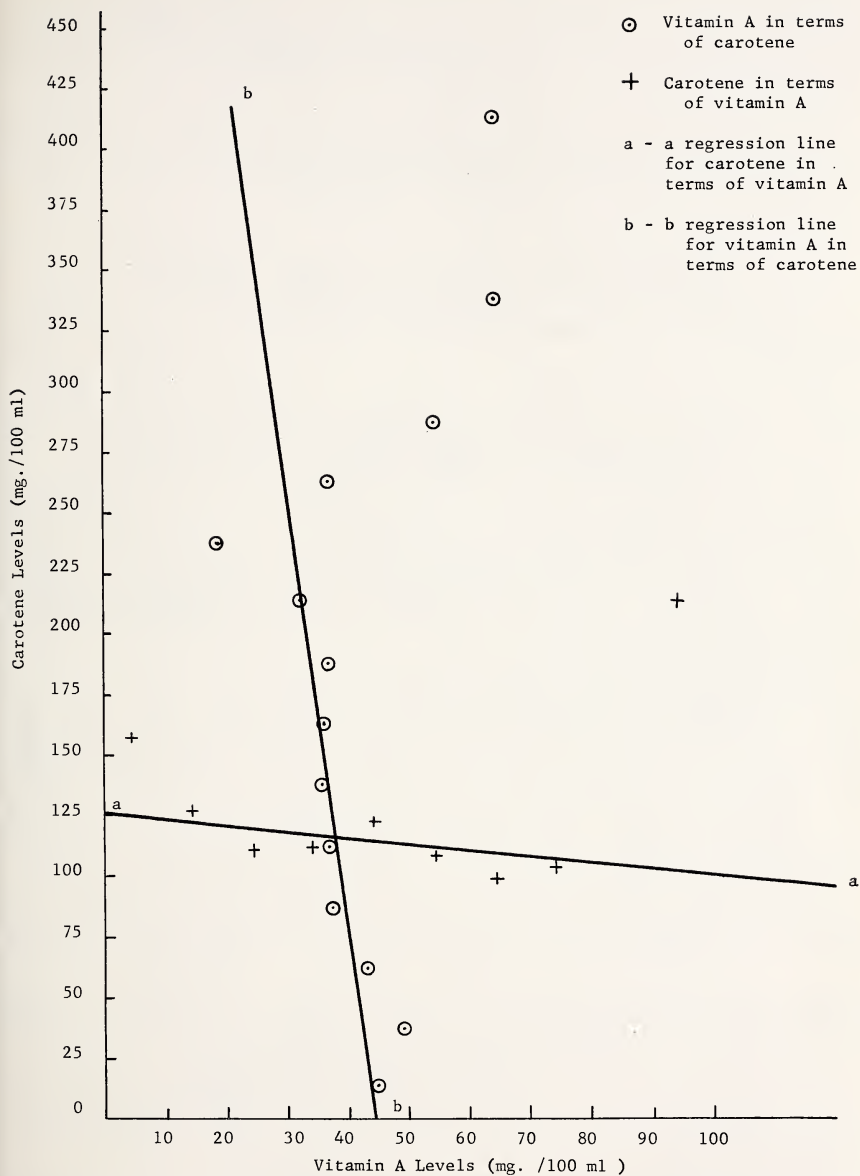


**FIGURE 3.**—Regression lines for carotene in terms of vitamin A and for vitamin A in terms of carotene.

mean serum vitamin A was somewhat lower than for winter and spring, it may be readily seen that for 139 of the 161 subjects studied in the fall months the mean was over 40 mcg%. The lower mean for fall was due to the very low serum vitamin A of the other 22 children from the three orphanages.

The mean serum carotene concentration was highest in the fall months with the greatest variation between individual school groups occurring during the winter months (Table VI).

## II. Associations Between Serum Vitamin A And Carotene Levels and Other Factors

### 1. Coefficient of Correlations between Serum Vitamin A and Serum Carotene

Both positive and negative correlations of coefficients ( $r$ ) between serum vitamin A and serum carotene were found in these studies and have likewise been reported in other studies of nutritional status.

The regression lines for carotene in terms of vitamin A and for vitamin A in terms of carotene were plotted for the combined subjects (937) from Experiments I and II (Figure 3). As can be seen from the slope of the lines, the association was not a close one. For these data  $r$  was found to be -0.12. Although this was statistically significant because of the large number of cases, the correlation was too low to be considered nutritionally important.

When the work in Experiment II was completed, a statistically significant positive correlation coefficient of 0.370 between the values for serum vitamin A and serum carotene was obtained. After finding this difference in the relationship of these two blood constituents, a series of computations and a study of analytical methods were initiated in an attempt to explain, if possible, to what these apparently different relationships could be attributed or if they were merely due to chance.

As has been stated, a macro-chemical analysis of blood samples obtained by venipuncture was used in Experiment I while micro-chemical analysis of samples drawn by finger-tip puncture was used in all the

TABLE VII.—Percentage Distribution of Subjects of Each Age According to Serum Levels of Vitamin A and Carotene

| Classification         | Age  |    |    |    |    |    |
|------------------------|------|----|----|----|----|----|
|                        | 8    | 9  | 10 | 11 | 12 | 13 |
| Vitamin A in Serum:    |      |    |    |    |    |    |
| Below 19 mcg.% (Poor)  | 1.6  | 7  | 13 | 7  | 13 | 8  |
| 20 to 30 mcg.% (Fair)  | 21.4 | 23 | 17 | 15 | 7  | 12 |
| Above 30 mcg.% (Good)  | 77.0 | 70 | 70 | 78 | 80 | 80 |
| Carotene in Serum:     |      |    |    |    |    |    |
| Below 74 mcg.% (Poor)  | 9    | 9  | 12 | 22 | 30 | 32 |
| 75 to 125 mcg.% (Fair) | 43   | 36 | 53 | 51 | 53 | 49 |
| Above 125 mcg.% (Good) | 48   | 55 | 32 | 27 | 17 | 19 |

TABLE VIII.—Correlations of Serum Vitamin A and Serum Carotene

| Group             | No. of<br>Subjects | Observat-<br>tions | Age   | Means with S. D. |       |          | r value | Levels of<br>Significance |
|-------------------|--------------------|--------------------|-------|------------------|-------|----------|---------|---------------------------|
|                   |                    |                    |       | Vitamin A        | S. D. | Carotene |         |                           |
| Survey            |                    |                    |       |                  |       |          |         |                           |
| Combined I & II   | 932                |                    | 8-13  | 38.7             | 14.3  | 115.8    | -0.102  | 1%                        |
| Combined I & II   | 743                |                    | 8-11  | 37.8             | 13.5  | 118.8    | -0.001  | none                      |
| Experiment I      | 404                |                    | 8-13  | 40.4             | 17.6  | 105.6    | -0.502  | 1%                        |
| Experiment I      | 385                |                    | 8-13  | 42.1             | 16.2  | 102.8    | -0.440  | 1%                        |
| Experiment I      | 149                |                    | 12-13 | 44.6             | 17.1  | 100.9    | -0.574  | 1%                        |
| Experiment II     | 487                |                    | 8-11  | 37.9             | 10.2  | 124.0    | 0.370   | 1%                        |
| Experiment I      | 30                 |                    | 9     | 36.3             | 15.2  | 121.2    | -0.489  | 1%                        |
|                   | 98                 |                    | 10    | 38.4             | 16.3  | 110.3    | -0.277  | 1%                        |
|                   | 116                |                    | 11    | 42.6             | 15.7  | 96.6     | -0.506  | 1%                        |
|                   | 101                |                    | 12    | 44.9             | 16.4  | 98.8     | -0.410  | 1%                        |
|                   | 38                 |                    | 13    | 47.9             | 14.7  | 98.8     | -0.532  | 1%                        |
| Metabolic Studies |                    |                    |       |                  |       |          |         |                           |
| Experiment V      | 11                 |                    | 7-9   | 51.6             | 6.9   | 124.0    | 0.115   | none                      |
| Well              |                    |                    |       | 53.2             | 6.1   | 130.0    | 0.103   | none                      |
| Febrile           |                    | 17                 |       | 51.0             |       | 101.0    | 0.525   | 5%                        |
| Experiment VI     | 12                 | 174                | 7-9   | 50.2             |       | 180.2    | 0.287   | 1%                        |
| Febrile           |                    | 24                 |       | 46.4             |       | 157.4    | 0.713   | 1%                        |
| Experiment VII    | 14                 | 117                | 7-10  | 27.8             | 7.4   | 106.8    | 0.648   | 1%                        |
| Febrile           | 11                 | 33                 |       | 28.3             | 8.8   | 104.6    | 0.848   | 1%                        |



other studies included. To compare the values obtained for the same subject by these two procedures, non-fasting blood samples were drawn simultaneously by both veni-puncture and finger-tip puncture from 25 subjects. The venous samples were analyzed by both methods. The two types of blood, that is venous and capillary, for each subject were both analyzed by the micro-chemical technique. Although there were variations in values obtained, the variations were not consistent either to method or to type of blood samples. In Experiment VI fasting blood samples from both vein and capillary were drawn from each of the 12 subjects at the beginning and end of the eight-week study. The means for the venous samples and the capillary samples, both analyzed by the micro-method, were not significantly different for vitamin A concentrations at either time or for carotene at the beginning of the experiment. There was a highly significant difference between the mean carotene levels of the venous and capillary blood at the end of the experiment.

Having ruled out analytical methods as a variable, three factors—(a) age of groups, (b) season of year, and (c) location of subjects within schools in the different agricultural areas—were investigated (Tables VII, VIII, and IX). Since 12- and 13-year-olds had been included in Experiment I, but not in Experiment II, an analysis was made for 743 subjects, 8 to 11 years, omitting the 12- and 13-year-old subjects. For

**TABLE IX.—Correlations of Serum Vitamin A and Carotene for Individual Schools in Experiment I and II**

| Group                   | No. of   | Mean mcg.% |          | r Value | Levels of    |
|-------------------------|----------|------------|----------|---------|--------------|
|                         | Subjects | Vitamin A  | Carotene |         | Significance |
| Experiment I (1947-49)  |          |            |          |         |              |
| Marksville              | 25       | 52         | 93       | -0.4803 | 5%           |
| Dufrocq                 | 25       | 49         | 124      | -0.4323 | 5%           |
| Bunkie                  | 34       | 46         | 104      | -0.5486 | 1%           |
| La. Baptist             | 12       | 44         | 66       | -0.6520 | 5%           |
| Ruston                  | 49       | 43         | 116      | -0.1928 | none         |
| Wisner                  | 30       | 42         | 78       | -0.7580 | 1%           |
| Breaux Bridge           | 33       | 41         | 104      | -0.7211 | 1%           |
| Winnsboro               | 51       | 41         | 91       | -0.5917 | 1%           |
| Winnfield               | 52       | 41         | 104      | -0.7343 | 1%           |
| L.S.U. Lab. School      | 30       | 38         | 132      | -0.9803 | 1%           |
| Plaquemine              | 41       | 29         | 108      | -0.2065 | none         |
| Gumbel Home             | 10       | 29         | 145      | -0.4790 | none         |
| Masonic Home            | 10       | 22         | 145      | -0.6868 | 5%           |
| Protestant Orphanage    | 2        | 10         | 137      | -1.0000 | 1%           |
| Experiment II (1950-51) |          |            |          |         |              |
| Highland                | 66       | 42         | 150      | 0.3786  | 1%           |
| Crescent                | 70       | 40         | 124      | 0.1934  | none         |
| Plaquemine              | 27       | 40         | 118      | 0.0874  | none         |
| Covington               | 99       | 39         | 106      | 0.4982  | 1%           |
| Gentilly                | 111      | 38         | 127      | 0.3290  | 1%           |
| Woodlawn                | 52       | 36         | 139      | 0.2994  | 5%           |
| Bossier                 | 62       | 33         | 109      | 0.3581  | 1%           |

these, a non-significant  $r$  was obtained. Several of the 404 subjects in the earlier study (Experiment I) had had zero values for serum vitamin A. Assuming that these might be in error, they were omitted from the computation, leaving 385 subjects. Although the  $r$  was lowered from -0.502 to -0.440, it was found to be highly significant and the relationship negative.

Previously the data have shown that serum levels of vitamin A were significantly higher for 12- and 13-year-olds than for subjects 8, 9, 10, or 11 years old and that serum carotene concentrations were found to decrease significantly with age between 8 and 13 years. This fact may account in part for the difference in the relationship found for the subjects in Experiment I and in Experiment II. When  $r$  was calculated for each age group in Experiment I, negative correlations were found (Table VIII). As is shown in Table IX, the coefficients of correlation for each school were separated into two groups, those of Experiment I and those of Experiment II. The difference was not between school groups but between groups in Experiment I and in Experiment II. Seasonal variations were also ruled out by a comparison of values (Table VI). Here again, both the positive and negative relationships may be observed for individual school groups in each season.

One real difference between the two groups of subjects was in the range of values. Serum vitamin A concentrations ranged from 0 to 89 mcg.% with a mean of  $40.4 \pm 17.6$  in Experiment I and from 16 to 73 mcg.% with a mean of  $37.9 \pm 10.2$  for Experiment II. The carotene values were lower for Experiment I ranging from 19 to 245 mcg.% with a mean of  $105.6 \pm 40.2$  as compared with a mean of  $124 \pm 45.0$  mcg.% for Experiment II.

The data from Experiment II have much more homogeneity and for this group of subjects even an inspection of the data shows that the higher serum vitamin A levels were accompanied by the higher values for serum carotene, a trend not observed in the other group.

None of the facts presented answers the question as to whether there is a definite relationship between these two blood nutrients. They do, however, offer an explanation as to why both positive and negative relationships and no relationship have been reported in nutritional status studies. Probably the relationship is a real one and is determined by the population samples observed.

In the metabolic studies on preadolescent girls this relationship between serum vitamin A and carotene was also studied. In Experiments V, VI and VII, there were 11, 12, and 14 subjects on controlled diets for 64, 56, and 50 days, respectively. The diets were constant in all nutrients except protein and contained 3,850, 3,551, and 3,615 I.U. of vitamin A, respectively. During these experiments several subjects experienced infections of the respiratory tract accompanied by body temperatures above normal. For each group coefficients of correlations between serum levels of vitamin A and carotene were determined for: (1) all subjects for all periods; (2) when the girls were febrile; and (3) in

**TABLE X.—Coefficients of Correlation of Vitamin A Intake with Serum Vitamin A and with Serum Carotene for Subjects on Self-Chosen Diets**

| Experiment | d. f. | Vitamin A Intake |                |
|------------|-------|------------------|----------------|
|            |       | Serum Vit. A     | Serum Carotene |
| II         | 484   | 0.77**           | 0.14*          |
| IV         | 5     | .3283            | .3461          |
| V          | 10    | .0799            | .2446          |
| VI         | 11    | .1232            | .1611          |
| VII        | 11    | -.2503           | .2268          |

\*\*Statistically significant at 1 percent.

\*Statistically significant at 5 percent.

Experiment V for those periods when the subjects were free of fever and infections. The results from Experiment V with 11 subjects showed that no significant relationship existed between serum vitamin A and carotene levels, either throughout the entire period or for those periods when the subjects were well.

Conversely, for the subjects in Experiments VI and VII statistically significant positive relations were found (Table VIII). Highly significant positive coefficients of correlation of 0.525, 0.713 and 0.848 existed between serum vitamin A and carotene in Experiments V, VI, and VII, respectively, for those periods in which the subjects were febrile. The elevation of the body temperatures above normal was accompanied by sharp decreases in serum concentrations of carotene and less dramatic ones in serum vitamin A (Figures 4 and 5). In Experiment VII, the elevations of body temperatures and changes in serum concentrations were definitely less than in the other two; however, the same relationship existed (Table VIII).

## 2. Interrelationships between Dietary Intakes and Serum Vitamin A and Carotene Concentrations

The vitamin A value of the diet as calculated from dietary records was correlated with serum concentrations of both vitamin A and carotene for the 484 subjects for whom both values were obtained in Experiment II, when the subjects were eating self-chosen diets. These same

**TABLE XI.—Mean Vitamin A and Carotene Values for 351 Subjects at Intervals of One Week**

| Measurement           | Mean Value |        | Standard Deviation |        | Standard Error |        | Coefficient of Variability (Percent) |
|-----------------------|------------|--------|--------------------|--------|----------------|--------|--------------------------------------|
|                       | Date 1     | Date 2 | Date 1             | Date 2 | Date 1         | Date 2 |                                      |
| Vitamin A mcg./100 ml | 38.3       | 39.0   | ±11.53             | ±11.15 | ±0.62          | ±0.60  | 16.63                                |
| Carotene mcg./100 ml  | 130        | 130    | ±51.19             | ±46.63 | ±2.74          | ±2.49  | 12.31                                |

| Blood Serum<br>Vitamin A<br>Concentration<br>(Average of<br>Two Deter-<br>minations) | Distribution of Cases According to Amount of Weekly Variation<br>mcg./100 ml. |         |         |         |           |           |           |           |           |           |                    | Number of<br>Cases at<br>Various<br>Blood<br>Levels |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|--------------------|-----------------------------------------------------|
|                                                                                      | mcg./100 ml.                                                                  |         |         |         |           |           |           |           |           |           |                    |                                                     |
|                                                                                      | 0-2.4                                                                         | 2.5-4.9 | 5.0-7.4 | 7.5-9.9 | 10.0-12.4 | 12.5-14.9 | 15.0-17.4 | 17.5-19.9 | 20.0-22.4 | 22.5-24.9 | 25<br>and<br>above |                                                     |
| mcg./100 ml.                                                                         |                                                                               |         |         |         |           |           |           |           |           |           |                    |                                                     |
| Under 25                                                                             | 3                                                                             | 2       | 2       | 1       | 3         | 1         | 1         | 1         | 0         | 1         | 0                  | 15                                                  |
| 25.0-29.9                                                                            | 10                                                                            | 12      | 7       | 3       | 5         | 2         | 1         | 2         | 0         | 0         | 2                  | 44                                                  |
| 30.0-34.9                                                                            | 12                                                                            | 14      | 11      | 10      | 9         | 5         | 5         | 1         | 1         | 2         | 2                  | 72                                                  |
| 35.0-39.9                                                                            | 13                                                                            | 13      | 16      | 5       | 7         | 8         | 4         | 3         | 3         | 0         | 4                  | 76                                                  |
| 40.0-44.9                                                                            | 9                                                                             | 15      | 9       | 5       | 8         | 8         | 5         | 3         | 4         | 2         | 3                  | 71                                                  |
| 45.0-49.9                                                                            | 3                                                                             | 5       | 5       | 2       | 2         | 4         | 1         | 0         | 0         | 1         | 6                  | 29                                                  |
| 50.0 & above                                                                         | 3                                                                             | 7       | 6       | 3       | 4         | 4         | 1         | 3         | 2         | 1         | 10                 | 44                                                  |
| Total Number<br>of Cases                                                             | 53                                                                            | 68      | 56      | 29      | 38        | 32        | 18        | 13        | 10        | 7         | 27                 | 351                                                 |
| Percentage<br>of Total                                                               | 15                                                                            | 19      | 16      | 8       | 11        | 9         | 5         | 4         | 3         | 2         | 8                  |                                                     |

TABLE XIII.—Variations of Serum Carotene Determinations on Samples from the Same Children at One-Week Intervals

| Blood Serum<br>Carotene Con-<br>centration<br>(Average of Two<br>Determinations) | Distribution of Cases According to Amount of Weekly Variations<br>mcg./100 ml. |     |       |       |       |       |       |       |       |       | Number of<br>Cases at<br>Various<br>Blood<br>Levels |     |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------------------------------|-----|
|                                                                                  | Number of Cases                                                                |     |       |       |       |       |       |       |       |       |                                                     |     |
|                                                                                  | 0-4                                                                            | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50 & above                                          |     |
| mcg./100 ml.                                                                     |                                                                                |     |       |       |       |       |       |       |       |       |                                                     |     |
| Less than 75                                                                     | 9                                                                              | 3   | 2     | 6     | 3     | 2     | 0     | 1     | 0     | 0     | 0                                                   | 26  |
| 75-99                                                                            | 25                                                                             | 13  | 9     | 7     | 7     | 4     | 4     | 2     | 0     | 0     | 1                                                   | 72  |
| 100-124                                                                          | 14                                                                             | 14  | 12    | 8     | 11    | 4     | 3     | 3     | 2     | 0     | 3                                                   | 74  |
| 125-149                                                                          | 12                                                                             | 14  | 10    | 12    | 10    | 2     | 3     | 3     | 2     | 2     | 1                                                   | 71  |
| 150-174                                                                          | 15                                                                             | 11  | 7     | 12    | 4     | 3     | 3     | 0     | 0     | 0     | 8                                                   | 63  |
| 175-199                                                                          | 0                                                                              | 0   | 4     | 4     | 3     | 1     | 1     | 2     | 0     | 0     | 6                                                   | 21  |
| 200 and above                                                                    | 2                                                                              | 3   | 1     | 4     | 4     | 1     | 0     | 1     | 2     | 0     | 6                                                   | 24  |
| Total Number<br>of Cases                                                         | 77                                                                             | 58  | 45    | 53    | 42    | 17    | 14    | 12    | 6     | 2     | 25                                                  | 351 |
| Percentage of<br>Total                                                           | 22                                                                             | 16  | 13    | 15    | 12    | 5     | 4     | 3     | 2     | 1     | 7                                                   |     |





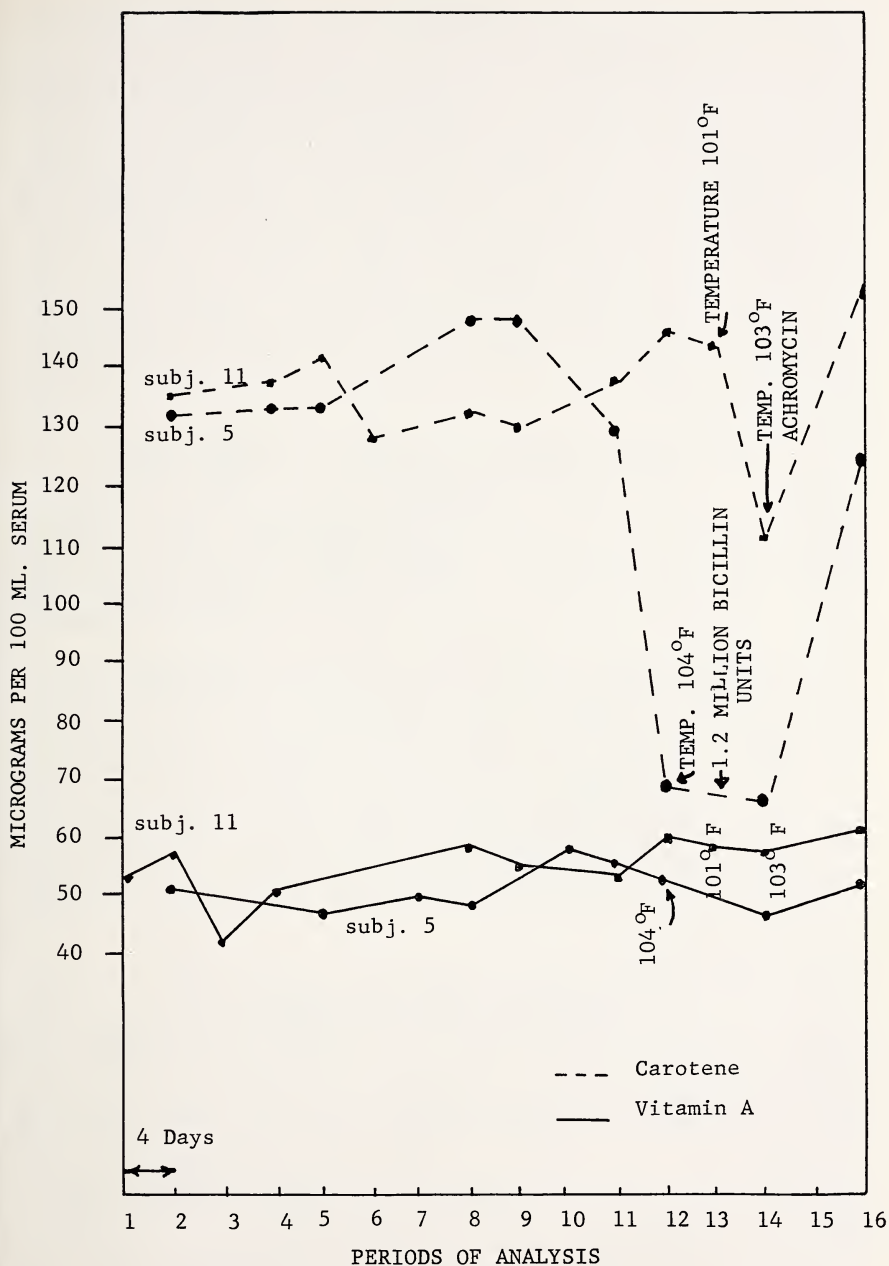


FIGURE 5.—Serum vitamin A and carotene concentrations for two subjects, 5 and 11, with elevated body temperatures and receiving antibiotics.

correlations were also computed for the two-weeks period preceeding each of the four metabolic experiments.

From the results of the survey group, vitamin A value of the diet appeared to be related to the serum vitamin A with a highly significant correlation of 0.77. A correlation coefficient of 0.14 was found between the vitamin A value of the diet and serum carotene. Although statistically significant, this latter  $r$  was much less than those found non-significant for the relatively few subjects on self-selected diets prior to controlled regimen of the metabolic studies (Table X). None of the correlations between the vitamin A intake of the preliminary diets and either the serum vitamin A or serum carotene concentrations were statistically significant. During each of the metabolic studies the girls consumed the same amounts of vitamin A, so such correlations could not be calculated.

### III. Weekly Variation in Serum Concentrations

The determinations for serum vitamin A and carotene were repeated at an interval of a week for 351 of the school children examined during 1950-1951 (Experiment III). The means of the concentrations for each week are presented in Table XI. The individual variations of serum vitamin A and carotene levels found for the same child at the one-week interval are tabulated in Tables XII and XIII, respectively.

Mean serum vitamin A values for the replicated determinations were 38.3 and 39.0 mcg.% with standard deviations of 11.5 and 11.2 mcg.%, respectively (Table XI). The average weekly difference in serum vitamin A for individual subjects was 10.3 mcg.%, with 58 percent of the cases having less variation. Of interest is the fact that the majority of cases with the greatest weekly deviation were those with the highest vitamin A serum concentration (Table XII). Sixty-five percent of the duplicate determinations on each blood sample showed a difference of less than 5 mcg.%, which is less variation than that found in the repeated analyses at a weekly interval.

Table XIII presents the distribution of cases according to weekly variations in carotene concentrations. The average deviation in carotene was 19.4 mcg.%. For approximately two-thirds of the subjects, the weekly variation was less than this average. The weekly variations were greater than the difference found between duplicates, as 93 percent of the duplicate determinations on individual serum samples varied less than 10 mcg.%.

Recognizing that the variability of the results was due in part to differences among children, in part to differences between the time or dates determinations were made, and in part to the uncontrolled error of the biochemical analysis, an analysis of variance (17) was used to apportion the total variance (Table XIV). In both cases, the  $F$  value or variance ratio among children had a probability of less than 1 percent that the differences were due to chance variation alone. Consequently, it is evident that there were real differences among the children in all

nutritional levels. Conversely, differences between dates, that is at a weekly interval, could be attributed to chance variation, as the variance ratio was less than that required at the 5 percent level of probability. In the instance of the carotene values, the variance between dates was less than that which could ordinarily be attributable to chance variation. The means for the two dates were identical, 130 mcg.%, with standard deviations of 51 mcg.% and 47 mcg.%, respectively (Table XI).

An analysis of variance of duplicate determination values for vitamin A and carotene showed no significant differences between duplicates for each serum sample. The magnitude of the error, however, was greater for vitamin A than for carotene, the latter being quite small.

Utilizing another measure of the uniformity of data, the coefficient of variation was also calculated (Table XI). As a criterion for reliability, at a cursory glance, the percentage for vitamin A may seem rather high. The amount of experimental error for the vitamin A method, although not statistically significant, influenced this value to some extent. When the range of values obtained for both vitamin A and carotene was considered, these coefficients of variation did not appear excessive. They do indicate the relative standard variation that may be expected for these two biological factors in the blood serum of growing children on unrestricted diets.

#### IV. Numbers of Samples Needed for Reliable Values

In a study of the nature and magnitude of variation in serum vitamin A and carotene in preadolescent children, it is vital to know if a sufficient number of subjects and of sample duplicates from these subjects have been analyzed to draw valid conclusions. Also from the viewpoint of economy of time, labor, and money, it is useful to know the relative number of determinations needed in terms of sample duplicates, number of subjects, and replicated sampling from the same subjects.

**TABLE XIV.—Analysis of Variance of Results of Replicate Sampling of Blood of 351 Children at Intervals of One Week**

| Source of Variation    | Number<br>of<br>Cases | Mean<br>Value | Analysis of Variance  |                |
|------------------------|-----------------------|---------------|-----------------------|----------------|
|                        |                       |               | Degrees of<br>Freedom | Mean<br>Square |
| Vitamin A: mcg./100 ml | 702                   | 38.7          |                       |                |
| Among Children         |                       |               | 350                   | 175.06*        |
| Between Dates          |                       |               | 1                     | 84.63          |
| Error                  |                       |               | 350                   | 82.41          |
| Carotene: mcg./100 ml  | 702                   | 130           |                       |                |
| Among Children         |                       |               | 350                   | 4167.4*        |
| Between Dates          |                       |               | 1                     | 4.0            |
| Error                  |                       |               | 350                   | 512.2          |

\*Statistically significant at 1 percent.

TABLE XV.—Analysis of Variance of Vitamin A on a Per Determination Basis

| Source            | d. f. | M. S. | Composition of M. S.                                    |
|-------------------|-------|-------|---------------------------------------------------------|
| Subjects          | 350   | 192.5 | $1/k_o (\sigma_d^2 + k_o \sigma_w^2 + 2k_o \sigma_s^2)$ |
| Weeks in Subjects | 350   | 90.6  | $1/k_o (\sigma_d^2 + k_o \sigma_w^2)$                   |
| Duplicates        | 40    | 25.7  | $\sigma_d^2$                                            |

$k_o$  = harmonic mean, a weighted average number determinations per sample.  
 $\frac{1}{\sum k}$

$$\frac{1}{N}$$

$\sigma_d^2$  = 26, variation between duplicate determinations on same serum sample.

$\sigma_w^2$  = 59, variation between samples taken a week apart.

$\sigma_s^2$  = 46, variation among subjects.

TABLE XVI.—Analysis of Variance of Serum Carotene on a Per Determination Basis.

| Source            | d. f. | M. S.  | Composition of M. S.                                    |
|-------------------|-------|--------|---------------------------------------------------------|
| Subjects          | 350   | 4584.1 | $1/k_o (\sigma_d^2 + k_o \sigma_w^2 + 2k_o \sigma_s^2)$ |
| Weeks in Subjects | 350   | 563.4  | $1/k_o (\sigma_d^2 + k_o \sigma_w^2)$                   |
| Duplicates        | 41    | 13.0   | $\sigma_d^2$                                            |

$k_o$  = harmonic mean, a weighted average number determinations per sample.  
 $\frac{1}{\sum k}$

$$\frac{1}{N}$$

$\sigma_d^2$  = 13, variation between duplicate determinations on same sample.

$\sigma_w^2$  = 500.4, variation between samples taken a week apart.

$\sigma_s^2$  = 1827.6, variation among subjects.

Such an analysis was made of the data collected, and its statistical evaluations in the weekly variations of serum vitamin A and carotene were presented in Part III. As was stated, the blood samples were drawn from each child exactly 7 days apart, but on different dates for different groups of children. Of the total 351 serum samples analyzed for each child on two dates, 40 and 41 of these analyses for vitamin A and carotene, respectively, were done in duplicates.

Since the previous statistical treatment was done on mean values for each child, part of which was the average of duplicate values, the mean squares obtained had to be multiplied by a "harmonic mean" or  $k$  number of determinations in order to put them on the same basis as the mean square for "duplicates." With the variance components determined (Tables XV and XVI), the relative number of subjects ( $s$ ), times of analysis ( $w$ ) and duplicates needed ( $d$ ) were calculated in the following manner.

1. To decide the relative number of times (weeks in this study) ( $w$ ) in proportion to the number of duplicate determinations on the same sample ( $d$ ), the following equation was used:

$$\text{variance of a subject mean} = \frac{\sigma_w^2}{w} + \frac{\sigma_d^2}{dw}$$

Tables XVII and XVIII give these computations for serum carotene and vitamin A.

TABLE XVII.—Ratio of the Variance of the Subject Mean for Carotene

| No. Det'm/Day<br>(Analysis on<br>Same Sample) | No. Times (weeks here) (w) |       |       |       |
|-----------------------------------------------|----------------------------|-------|-------|-------|
|                                               | 1                          | 2     | 4     | 6     |
| 1                                             | 513.0                      | 257.0 | 128.0 | 85.0  |
| 2                                             | 507.0                      | 253.0 | 126.0 | 84.0  |
| 4                                             | 503.0                      | 251.0 | 125.8 | 83.54 |

From Table XVII it can be seen, in the case of carotene determinations, that two different measurements (two weekly ones in this experiment) would be much more important than duplicates on the same sample. In each instance increasing the weekly measurements (w) gave a value that differed less from the mean in such a proportion as to justify increasing the number of times samples were to be taken for analyses. However, increasing the number of repeated determinations on a given sample would not accomplish very much. Nothing will be gained in repeating determinations on samples when the technique used in a given laboratory has been proven to give results that vary as slightly as was the case in this work.

TABLE XVIII.—Ratio of the Variance of the Subject Mean for Vitamin A

| No. Det'm/Day | No. Times (weeks here) (w) |    |      |    |
|---------------|----------------------------|----|------|----|
|               | 1                          | 2  | 4    | 6  |
| 1             | 85                         | 43 | 22   | 14 |
| 2             | 72                         | 37 | 18   | 12 |
| 4             | 66                         | 33 | 16.6 | 11 |

For serum vitamin A, the variance in duplicates of the samples was larger than that for carotene and the variance between subjects was much smaller. It was found again, however, that increasing the number of times blood serum of a subject was sampled was more important than making duplicate analyses on the same sample. The smaller ratio indicated that a single determination run on four samples taken at different times would give a more valid answer than duplicate determinations on two samples taken at different times; the ratios being 22 to 37.

2. To decide the relative number of times (w) in proportion to the number of subjects (s) the following equation was employed:

$$\text{variance of a treatment mean} = \frac{\sigma_d^2}{swd} + \frac{\sigma_w^2}{sw} + \frac{\sigma_s^2}{s}$$

In using this equation it is assumed (d) is a constant. In the present experiment the mean squares have been weighted for (d) to have a



constant value of 2. However, for comparison, values are also given assuming (d) has a value of 1 (Tables XIX and XX).

**TABLE XIX.—Ratio of the Variance of a Treatment Mean for Carotene**

| No. Weeks<br>(w) | No. Subjects (s) d=2 |       |       | No. Subjects (s) d=1 |       |      |
|------------------|----------------------|-------|-------|----------------------|-------|------|
|                  | 5                    | 10    | 50    | 5                    | 10    | 50   |
| 1                | 467.0                | 233.6 | 47.13 | 475.2                | 234.0 | 47.2 |
| 2                | 416.7                | 200.3 | 42.07 | 417.4                | 200.7 | 42.0 |
| 4                | 391.3                | 196.2 | 40.03 | 391.6                | 196.3 | 40.0 |
| 10               | 376.1                | 188.4 | 38.00 | 376.6                | 188.1 | 38.0 |

From these ratios (Tables XIX and XX) it can be easily determined that increasing the number of subjects from which samples are drawn is more important than taking several samples from the same subjects. Relatively little is to be gained toward securing a smaller variance by increasing the number of serum carotene samples taken from a given subject from 4 to 10. At the same time, doubling the number of subjects from 5 to 10 gives a decidedly smaller variance ratio. Comparison of the two groups of figures demonstrated that the use of duplicate analyses for carotene did not give a better value than the single determination even with as few as 10 subjects on two dates or 5 subjects on four dates.

**TABLE XX.—Ratio of the Variance of a Treatment Mean for Vitamin A**

| No. Weeks<br>(w) | No. Subjects (s) d=2 |      |     | No. Subjects (s) d=1 |     |     |
|------------------|----------------------|------|-----|----------------------|-----|-----|
|                  | 5                    | 10   | 20  | 50                   | 20  | 50  |
| 1                | 26.0                 | 12.3 | 5.9 | 2.6                  | 6.5 | 2.8 |
| 2                | 16.4                 | 8.2  | 3.8 | 1.6                  | 4.1 | 1.7 |
| 4                | 12.9                 | 6.4  | 3.1 | 1.3                  | 3.2 | 1.3 |

For vitamin A a single determination run on samples from 20 subjects taken on four different dates (w) would give a slightly more valid mean than duplicate determinations on 20 samples taken on two different dates, the ratio being 3.2 to 3.8. With as many as 50 subjects, virtually nothing would be gained by running duplicate analyses on the same serum sample.

3. In determining the number of subjects needed, the following facts were considered:

In all experiments on nutritional status and particularly in studies dealing with surveys of large populations, one is always concerned about the number of subjects needed for dependable answers. The mean serum concentrations for the 351 subjects in this work were 130 mcg.% and 39 mcg.%, respectively, for carotene and vitamin A.

If the accuracy desired was that within 10 percent of the mean 95 percent of the time, the number needed for carotene could be determined by the equation:

$$\text{variance of a treatment mean} = \frac{13}{\text{swd}} + \frac{500.4}{\text{sw}} + \frac{1827.6}{s}$$

This is also the equation used in determining the ratios for (w) and (s) in Tables XIX and XX. For these calculations it can be seen that a total of 50 subjects with two measurements on different dates will give a mean for serum carotene meeting this degree of accuracy. This holds for a population group with a range in carotene values as great as the one sampled in Experiment III; that is, 23 to 414 mcg.%. For vitamin A  $\text{sx}^{-2}$  is 3.8 mcg.%. A minimum of 20 subjects, with determinations (w) made on two dates and run in duplicate, would give a mean serum vitamin A value within 10 percent of the true mean 95 percent of the time. If as many as 50 subjects are used and their serum vitamin A concentrations are determined at least twice, having duplicate values for these analyses would not improve the accuracy of the mean value over that obtained from a single determination per sample. Mean values obtained in either case would be nearer to the true value than criteria set in the instance cited above.

The most expensive part of a survey is the cost of sending a survey team to the different areas. The drawing of blood samples for 50 subjects by finger-tip puncture on one day is no more costly than obtaining 20 samples on the same day. The ratios between subjects and number of measurements (w) in Table XX show that a mean obtained from 50 subjects at any one time is closer to the true value than one obtained from 20 subjects for whom two or even four different determinations were made.

The cost in materials and laboratory hours is approximately the same per single determination whether the serum in question is a sample duplicate, subject duplicate or replicate or a single serum sample from one subject. For a mean carotene serum concentration, the use of 1 determination on 50 subjects is approximately eight times more efficient in establishing a mean serum value that is stable than is use of 10 measurements on 5 subjects.

Such a study of data emphasizes the need of determining the relationship of these measurements in terms of number of subjects, determinations per subject and per sample and to use the results obtained in an effort to control efficiency of data, costs, and time consumed.

The analyses just presented showed the variations found in non-fasting blood samples from a population sample of Louisiana school children ranging in age from 8 to 11 years and eating self-chosen diets. The variations found on fasting blood samples taken at closer intervals from a selected group living on a constant dietary regimen might be entirely different. The variations found for such a group of 37 girls consuming approximately 3,770 I.U. of Vitamin A have been calculated and are presented in Part V.

## V. Variations of Serum Vitamin A And Carotene Concentrations on Controlled Dietary Regimens

Almost without exception, each subject who participated in the three metabolic studies (Experiments V, VI, VII) cooperated to the fullest. Consequently, the results included continuous blood serum data over periods of 50 to 64 days. Serum vitamin A and carotene were determined at the beginning of each 4- or 6-day dietary period. Therefore, each individual's mean value (Table XXI) was based on from 8 to 16 replicates.

Subjects No. 1 through No. 23 had daily intakes of 3,850 I.U. of Vitamin A with all other nutrients meeting or exceeding the allowances as given by the National Research Council (5). The daily intakes of vitamin A averaged 3,615 I.U. for subjects No. 24 through No. 38. Their average daily diets as analyzed supplied 22.1 gm. of protein and 2,200 calories. All other nutrients were present in the same amounts as the controlled diets of the other subjects.

There were highly significant differences in both serum vitamin A and serum carotene concentrations between individuals. The serum carotene had greater individual variations than serum vitamin A (Figures 6 and 7). No significant differences were found within individual subjects (between periods) for either vitamin A or carotene levels for subjects No. 1 through No. 23, but the F value for carotene was only slightly lower than the value required for significance at the 5 percent level of probability. The serum levels of both vitamin A and carotene did vary significantly within individuals as well as between periods for subjects No. 24 to No. 38 in Experiment VI.

From the data recorded in Table XXI the magnitude of the differences between subjects as well as that of the range for each individual may be studied. For both vitamin A and carotene the difference of the means between subjects was large. For vitamin A the range of the means was from a low of 20 mcg.% for subject No. 33 to a high of 72.5 mcg.% for subject No. 18. Mean serum carotene blood levels ranged from a low 71.8 mcg.% for subject No. 35 to a high of 253.5 mcg.% for subject No. 14. The mean serum vitamin A values for subjects No. 1 through No. 23 were quite similar and were approximately 50 percent higher than values for subjects No. 25 through No. 38. Although these latter values could not be considered critical, they were definitely lower than the value which indicates good nutritional status in relation to blood levels of vitamin A. Subjects No. 12 through No. 23 (Experiment VI) had good serum carotene values which were higher than both the other two groups.

Serum vitamin A levels on intakes of 3,850 I.U. and a constant dietary regimen "adequate" in all nutrients, remained fairly constant for each individual when free of fever. However, different subjects maintained different levels, varying as much as 33 percent. Even if vitamin A concentrations were considered characteristic of the individual (4) there were

**TABLE XXI.—Serum Vitamin A and Serum Carotene Concentrations for Individual Subjects on Controlled Dietary Intakes**

| Subject No.    | Serum Vitamin A<br>mcg./100 ml. |      |       | Serum Carotene<br>mcg./100 ml. |      |         |
|----------------|---------------------------------|------|-------|--------------------------------|------|---------|
|                | Mean                            | S.D. | Range | Mean                           | S.D. | Range   |
| Experiment V   |                                 |      |       |                                |      |         |
| 1              | 49                              | 5    | 41-59 | 130                            | 5    | 122-137 |
| 2              | 49                              | 7    | 39-59 | 74                             | 17   | 52-97   |
| 3              | 47                              | 4    | 41-53 | 112                            | 20   | 78-134  |
| 4              | 52                              | 4    | 47-59 | 157                            | 14   | 136-173 |
| 5              | 52                              | 4    | 47-58 | 114                            | 37   | 67-148  |
| 6              | 49                              | 6    | 44-60 | 104                            | 26   | 52-124  |
| 7              | 58                              | 6    | 50-65 | 144                            | 9    | 130-152 |
| 8              | 51                              | 4    | 45-61 | 96                             | 4    | 88-102  |
| 9              | 51                              | 6    | 40-61 | 118                            | 9    | 102-130 |
| 10             | 60                              | 3    | 57-65 | 156                            | 9    | 146-169 |
| 11             | 58                              | 2    | 54-61 | 135                            | 13   | 111-151 |
| Group          | 53                              | 6    | 39-65 | 123                            | 29   | 52-173  |
| Experiment VI  |                                 |      |       |                                |      |         |
| 12             | 44                              | 9    | 22-57 | 142                            | 18   | 109-173 |
| 13             | 45                              | 5    | 31-53 | 152                            | 27   | 84-184  |
| 14             | 49                              | 7    | 40-67 | 254                            | 10   | 238-276 |
| 15             | 54                              | 9    | 28-70 | 200                            | 46   | 106-251 |
| 16             | 51                              | 6    | 38-60 | 235                            | 31   | 159-271 |
| 17             | 53                              | 6    | 46-68 | 210                            | 18   | 158-234 |
| 18             | 72                              | 16   | 56-80 | 173                            | 10   | 159-194 |
| 19             | 47                              | 5    | 36-57 | 152                            | 7    | 139-160 |
| 20             | 43                              | 7    | 33-60 | 118                            | 18   | 76-147  |
| 21             | 44                              | 3    | 36-49 | 178                            | 22   | 138-212 |
| 22             | 54                              | 4    | 43-60 | 197                            | 11   | 183-219 |
| 23             | 52                              | 5    | 44-65 | 164                            | 16   | 120-182 |
| Group          | 51                              | 10   | 22-80 | 181                            | 44   | 76-276  |
| Experiment VII |                                 |      |       |                                |      |         |
| 24             | 34                              | 4    | 28-41 | 131                            | 11   | 114-147 |
| 25             | 31                              | 2    | 29-33 | 139                            | 18   | 120-156 |
| 26             | 27                              | 3    | 23-30 | 104                            | 12   | 90-123  |
| 27             | 32                              | 4    | 26-36 | 120                            | 13   | 102-139 |
| 28             | 25                              | 5    | 18-34 | 99                             | 6    | 91-108  |
| 29             | 30                              | 8    | 18-42 | 115                            | 13   | 98-134  |
| 30             | 25                              | 6    | 16-33 | 93                             | 17   | 72-126  |
| 31             | 38                              | 9    | 24-55 | 122                            | 27   | 89-166  |
| 32             | 30                              | 8    | 20-42 | 126                            | 16   | 97-143  |
| 33             | 20                              | 6    | 11-30 | 77                             | 9    | 66-91   |
| 34             | 28                              | 5    | 22-34 | 100                            | 6    | 93-111  |
| 35             | 21                              | 5    | 16-31 | 72                             | 8    | 65-90   |
| 36             | 24                              | 6    | 16-33 | 116                            | 16   | 93-145  |
| 38             | 27                              | 9    | 13-40 | 102                            | 30   | 74-158  |
| Group          | 28                              | 7    | 11-55 | 107                            | 23   | 65-166  |
| Summary        |                                 |      |       |                                |      |         |
| Entire Group   | 42                              | 12   | 11-80 | 136                            | 43   | 52-276  |

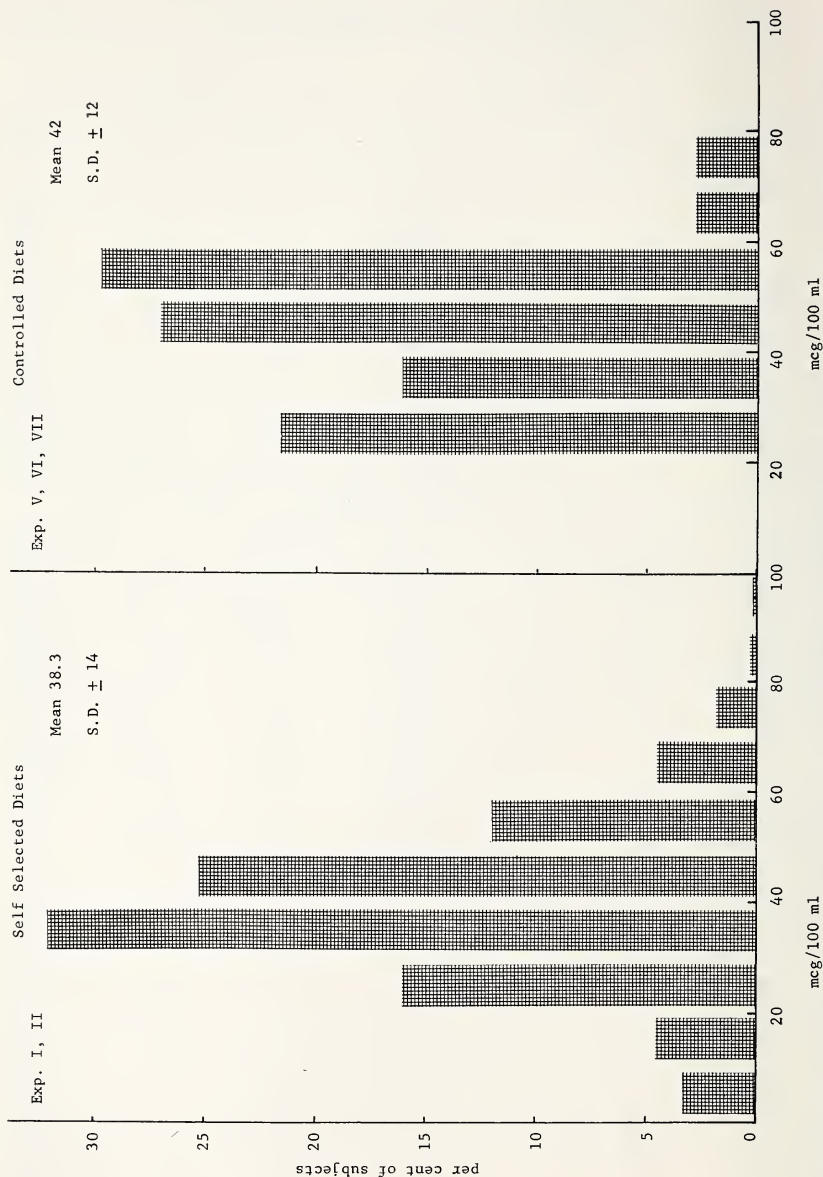


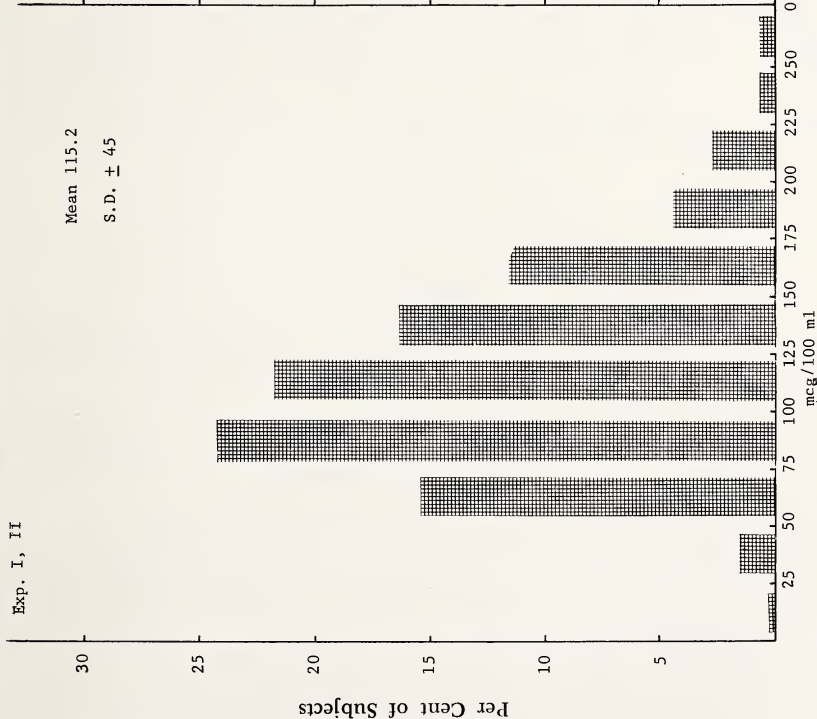
**FIGURE 6.—Serum vitamin A levels from children on self-selected diets and on controlled dietary regimens.**



# Self-Selected Diets

Exp. I, II

Mean 115.2  
S.D.  $\pm$  45



# Controlled Diets

Exp. V, VI, VII

Mean 136  
S.D.  $\pm$  43



FIGURE 7.—Serum carotene levels from children on self-selected diets and on controlled dietary regimens.

at least 4- or 6-day fluctuations in the serum levels of the 38 individual subjects while on constant dietary regimens.

The vitamin A serum concentrations appeared to be more stable and therefore a more accurate measurement of vitamin A status of children than serum carotene levels. Agnes Fay Morgan (10) has written: "Usually the circulating levels of vitamin A and carotene are of similar magnitudes; that is high levels of vitamin A often are present when the carotene levels are high. This is not always true, however, since the serum carotene reflects only the recent and current intake of the green and yellow vegetables and fruits, main sources of carotene, while the vitamin A level represents the physiologically active form of the vitamin, produced by intakes of both animal Vitamin A from milk, fat, fish oils, egg yolk, and liver and by transformation in the body from the carotene obtained from certain vegetables and fruits, egg yolk, and to some extent also from milk fat. A current or recent change in dietary carotene may raise or lower the level of that substance in the blood without effect upon the serum vitamin A. The latter is therefore the true criterion of vitamin A nutriture, the former only of current carotene intake."

The mean serum values for the girls in these metabolic studies varied less and were higher than were the means of the survey group. The means for these girls were: vitamin A,  $42 \pm 12$  mcg.%; carotene,  $136 \pm 43$  mcg.% as compared with  $38 \pm 14$  and  $115 \pm 45$  mcg.%, respectively, for the survey group (Figures 6 and 7).

## Summary

Data from surveys of nutritional status of 959 preadolescent Louisiana boys and girls and metabolic balance studies of 37 girls, 7 to 10 years of age, have been presented:

1. to describe the relationship of age, sex, season of the year, and location in school within four agricultural areas of Louisiana, to the serum levels of vitamin A and carotene;
2. to determine coefficients of correlation between
  - (a) serum concentrations of vitamin A and carotene
  - (b) dietary intake of vitamin A and carotene and serum levels;
3. to characterize the magnitude of variations in serum concentrations of vitamin A and carotene
  - (a) in non-fasting blood samples from children on self-chosen diets
  - (b) in fasting blood samples from girls on controlled intakes;
4. to define the size of sample and number of repeated measurements needed to yield reliable values.

The mean serum concentrations of vitamin A increased significantly from 38.3 mcg.% for the 8-year-olds to 45.9 mcg.% for the 13-year-olds. For carotene a converse trend was seen; the mean dropped from 126.8 mcg.% for 8-year-olds to 99.2 mcg.% for 13-year-olds.

No statistically significant differences were found between the mean serum levels for boys and girls. However, the males had higher mean carotene concentrations than did the females within each age group.

There were statistically significant differences in the serum levels of both the preformed vitamin A and carotene for subjects living in different agricultural areas of Louisiana.

No real seasonal difference was found for serum levels of vitamin A, but the mean serum carotene was highest in the fall months.

Both positive and negative coefficients of correlation between serum vitamin A and serum carotene were found for non-fasting blood samples from individuals on self-chosen diets. Significant positive correlations were found for preadolescents of similar age and sex on a constant regimen meeting their daily dietary needs. Elevations of body temperatures above normal have been shown to lower both vitamin A and carotene blood levels. Under such circumstances a direct parallelism existed between the two levels. From the results of the survey group, vitamin A value of the diet appeared to be significantly related to the serum vitamin A. None of the correlations between the vitamin A intake, on self-chosen diets for two weeks previous to the metabolic balance studies, for either serum vitamin A or carotene were statistically significant.

Among the survey subjects the range of serum levels of vitamin A and carotene was 0.0 to 99 mcg.% and 23 to 414 mcg.% with means of  $38.3 \pm 13.9$  and  $115.2 \pm 44.5$  mcg.%, respectively.

Girls 7 to 10 years of age on controlled dietary intakes averaging 3,770 I.U. of vitamin A maintained mean serum concentrations of vitamin A ranging from 20 mcg.% to 72 mcg.% and averaging  $42 \pm 12$  mcg.%. The mean carotene values for the same subjects ranged from 72 mcg.% to 254 mcg.% and averaged  $136 \pm 43$  mcg.%. The extremes of the levels of these two constituents in blood serum were 11 to 80 mcg.% for vitamin A and 52 to 276 mcg.% for carotene.

Replicates of mean vitamin A serum values at a weekly interval for 351 children averaged  $38.3 \pm 11.5$  mcg.% for the first analysis and  $39.0 \pm 11.2$  mcg.% for the second. Replicates of the mean carotene serum values were identical, 130 mcg.%, with standard deviations of  $\pm 15.2$  mcg.% and 46.6 mcg.% for the first and second replicates, respectively.

Results of this study indicated that for a survey study using techniques of comparable accuracy, 50 subjects with two measurements on different dates will give an average value for serum carotene within 10 percent of the mean 95 percent of the time. This holds for a population with a range in serum carotene as great as 23 to 414 mcg.%. A minimum of 20 subjects with determinations made on two dates and run in duplicate would be required for the same degree of accuracy for serum vitamin A. If as many as 50 subjects were used, duplicate values for the analyses would not improve the accuracy of the mean value over that obtained from a single determination per sample. For carotene values the single sample determination gave as reliable a mean as did duplicated ones.

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# ***Head Loss in Irrigation Pipe Couplers***

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# Head Loss in Irrigation Pipe Couplers

W. F. LYTLE<sup>1</sup> AND JAMES E. WIMBERLY<sup>2</sup>

## INTRODUCTION

Irrigation systems contain pipe, fittings, and couplers, each of which causes head loss in the system. Several methods have been used to determine the actual head loss in portable irrigation pipe with quick couplers. One of the most practiced methods is using Scobey's Equation. This equation, when used with a friction coefficient, results in the total head loss of the system. The friction coefficient commonly used is 0.40, which is sufficient to cover loss in the pipe, couplers, and fittings that may be used.

The sprinkler Irrigation Handbook (5) presents a head loss table for aluminum irrigation pipe with couplers. The table is based on Scobey's Equation using  $K_s = 0.34$  for 2-inch pipe,  $K_s = 0.33$  for 3-inch pipe and  $K_s = 0.32$  for pipe of all other sizes.

Some irrigation engineers use Scobey's Equation in their design work with varied friction coefficients.

Scobey's Equation for aluminum irrigation systems is:

$$H_f = \frac{K_s L V^{1.9}}{1000.0 D^{1.1}}$$

Where  $H_f$  = total friction loss in feet of water

$K_s$  = Scobey's friction coefficient

$L$  = length of pipe in feet

$V$  = mean velocity in feet per second

$D$  = internal diameter in feet

W. O. Ree (3) in a report on "Head Loss in Quick-Coupled Aluminum Pipe" showed results of some tests previously conducted with calculations of coefficients from three formulas. These were Scobey's formula, the Manning formula, and the Hazen-Williams formula. Relationships were then worked out to convert the friction loss values to coefficients for the more common formulas. In addition to these formulas, some designers use the head loss of a coupler in equivalent feet of pipe and  $H_f = K_c (V^2/2g)$  where  $H_f$  = total head loss and  $K_c$  = friction coefficient.

The authors have conducted a study of several different types and sizes of quick couplers. This study was conducted as Project 894 of the Louisiana State University Agricultural Experiment Station. The study was to determine the actual head loss from individual couplers. With this value known, the design of an irrigation system could be more exact, and information gained might help in the future design of couplers. This study is the subject of this report.

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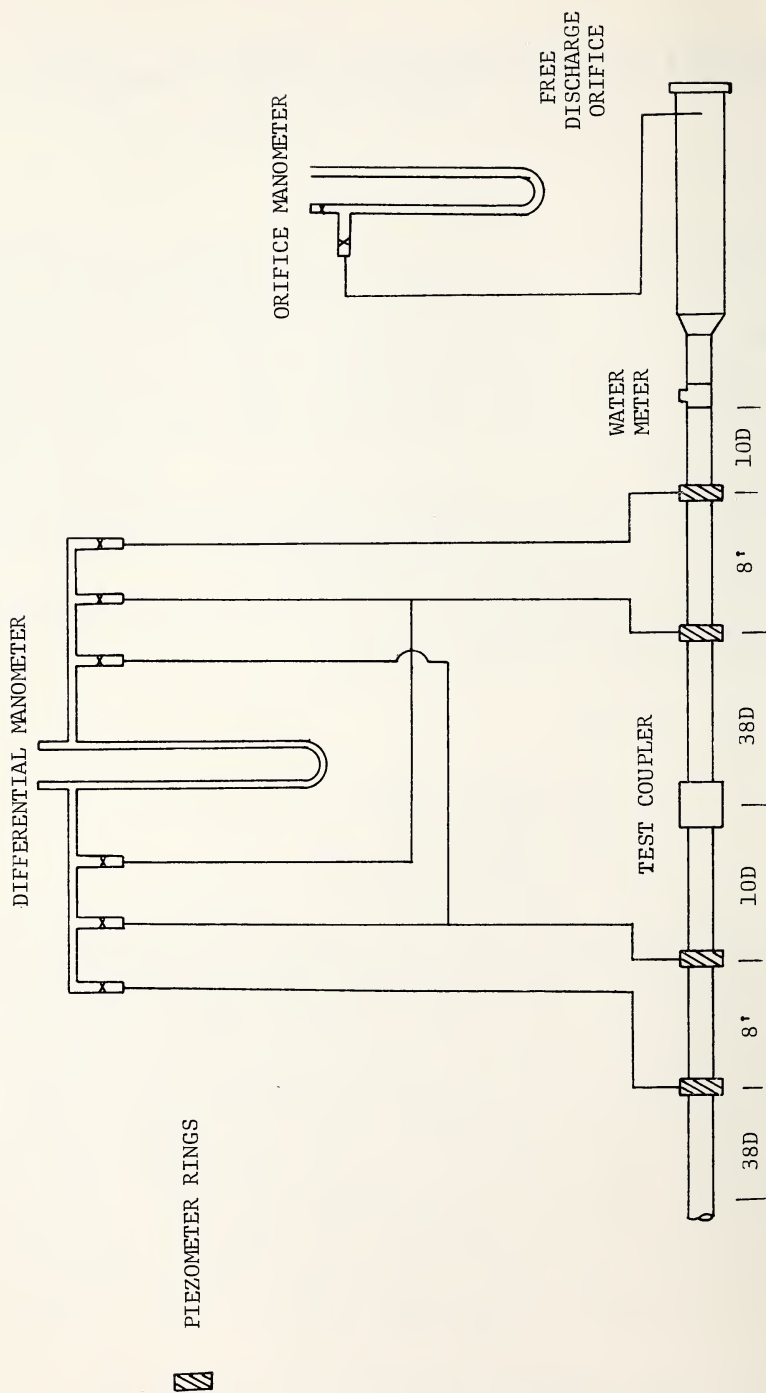


FIGURE 1.—Schematic of testing apparatus with distances between test sections.



## PROCEDURE

Most manufacturers of irrigation pipe quick couplers supplied a coupler of each size and type. Only 3-, 4-, 5-, and 6-inch couplers were tested. The flow of water was obtained by a gas engine-driven centrifugal pump. Flow direction is shown in Figure 1, along with the distances between pipe test section and coupler. The lengths of straight pipe upstream and downstream from the test points were sufficient to insure uniform flow conditions at the test points.

The flow rates were measured by a calibrated orifice and an in-line water meter, and were controlled by a valve upstream from the orifice meter.

A piezometer ring was installed on the pipe at each test point to insure uniform pressure readings at that point. (Figure 2 shows a piezometer and test coupler.) The head loss across the test sections of pipe and across the coupler were measured with a "U" tube manometer. The loss across the 8-foot pipe sections and the loss of the center section with the test coupler permitted the computation of the loss due to the coupler.

Each coupler was first tested in a straight position, with the axis of the upstream pipe and downstream pipe in a straight line. Each coupler was then tested in the maximum misaligned position which the individual coupler would permit, with the axis of the upstream pipe at an angle to the axis of the downstream pipe. The amount of misalignment was measured by the offset angle between the two pipe axes.

In each position, all couplers were tested at different flow rates to provide sufficient test points to obtain an average head loss value. The flow rates for the different size couplers were: 3-inch couplers—125 to 350 gpm (0.279 to 0.780 cfs); 4-inch couplers—200 to 600 gpm (0.447 to 1.34 cfs); 5-inch couplers—500 to 1,100 gpm (1.11 to 2.46 cfs); 6-inch



FIGURE 2.—Test coupler and piezometer ring mounted on 6-inch irrigation pipe.

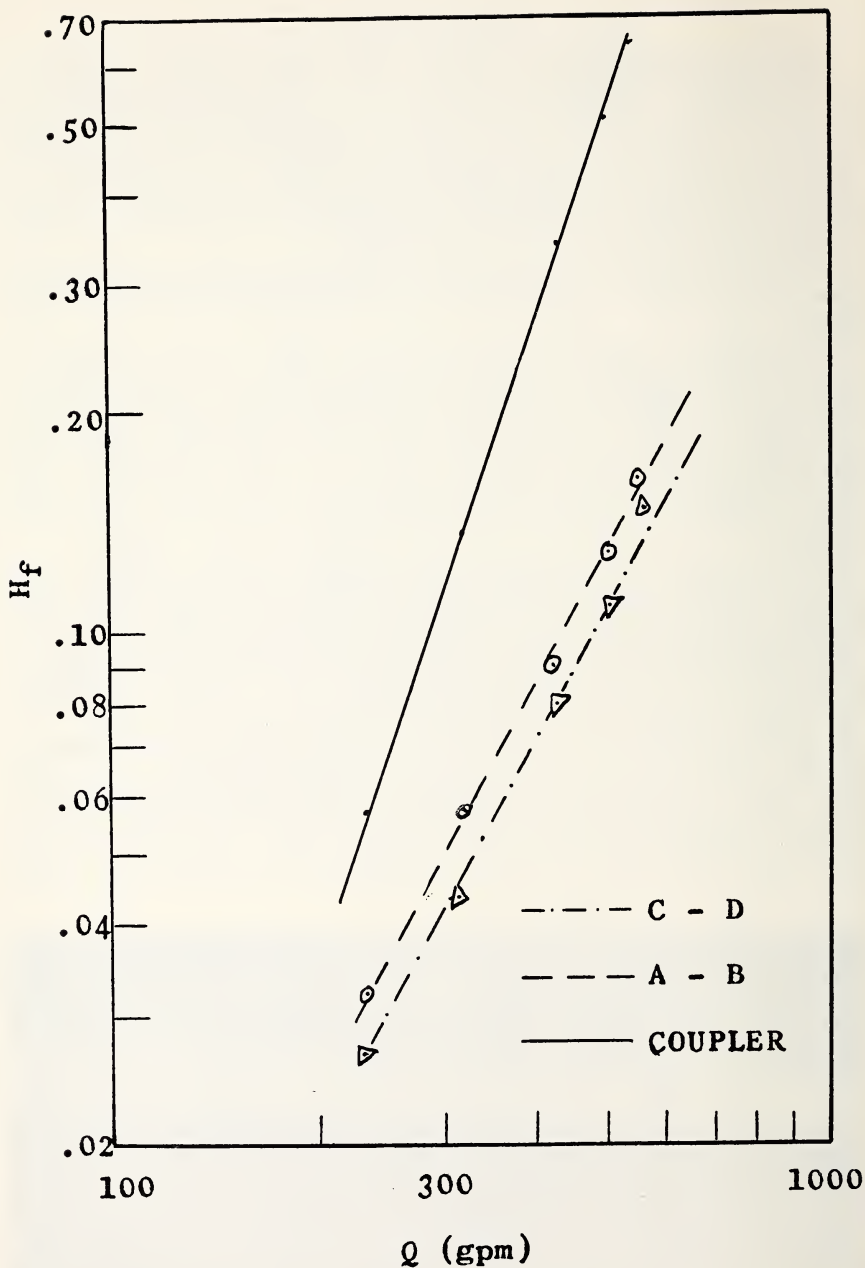


FIGURE 3.—Test results from coupler F, 4-inch size,  $0^\circ$  position, plotted on logarithmic scale. Line A-B represents the loss across the upstream pipe test section; Line C-D represents the loss across the downstream pipe test section. The line marked "Coupler" represents the loss across the coupler.

couplers—800 to 1,500 gpm (1.78 to 3.35 cfs). The test results were plotted as shown in Figure 3.

### DESCRIPTION OF COUPLERS

Figure 4, showing the cross-sectional drawings of the couplers, will help in understanding the description of each coupler.

Couplers B and P are the only couplers tested that do not have a riser outlet. Coupler B is a single end coupler, that is, it clamps securely to one pipe end, the other end of the coupler making the quick coupling arrangement with another pipe.

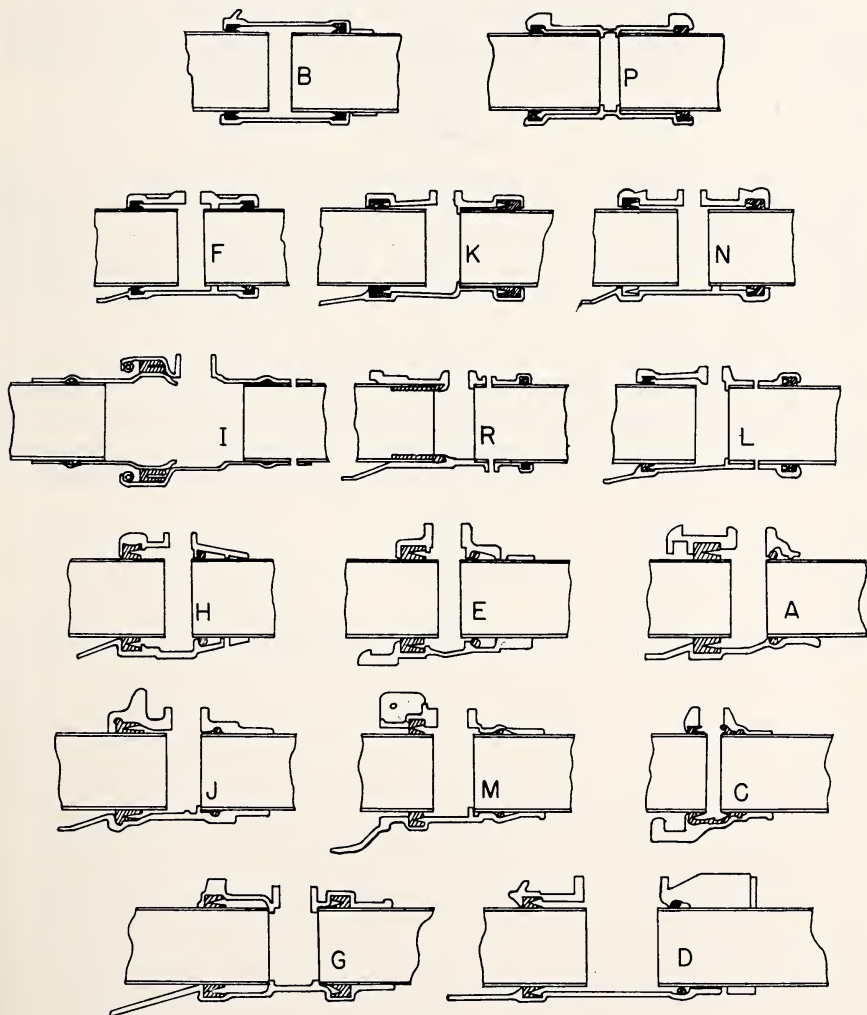


FIGURE 4.—Cross section of couplers tested.

The remaining couplers have a riser outlet. Coupler D has a 3-inch riser outlet; all others have a 1-inch riser outlet.

Couplers F, K, and N are double end couplers. Each uses two female gaskets.

Couplers I, R, and L are single end couplers with one end bolted to the pipe. The other pipe end makes the quick coupling.

Couplers H, E, A, J, M, C, G, and D are single end couplers. Each coupler clamps securely to one pipe end, leaving one pipe end for the quick coupling.

Coupler R uses a male gasket, which is mounted on the end of the pipe. All other couplers use female gaskets, either flat, V-notch, or "O" ring. Coupler C has one gasket that seals both pipe ends.

These were the only couplers tested in this study. All of the couplers tested can be installed on plain end pipe with very little work and tools. No tests were made on couplers that are "factory installed only."

## RESULTS

Tables 1, 2, 3, and 4 are summaries of the results. Results from the test of head loss of each coupler were expressed as  $K_s$  to be used in Scobey's Equation,  $K_c$  to be used in the equation  $H_f = K_c (V^2/2g)$ , and in terms of equivalent feet of pipe. The equivalent length of pipe represents that length of straight pipe that would give the same loss at the same flow rate.

The values of  $K_s$  for all sizes and types and positions range from 0.211 to 0.384. The values of  $K_c$  range from 0.02 to 0.335. The equivalent feet of pipe ranges from 0.635 feet to 11.20 feet. The value depends on the type of coupler, the size, alignment of pipe, and the velocity of flow. The average  $K_s$  of couplers of the same size is shown in Table 5.

**TABLE 1.—Head Loss and Coefficients of 3-Inch Couplers in the Straight and Misaligned Positions**

| Coupler | Misalignment<br>(degrees) | Head loss in<br>equivalent<br>feet of pipe | Ks   | Kc   |
|---------|---------------------------|--------------------------------------------|------|------|
| A       | 0                         | 1.39                                       | .246 | .075 |
|         | 11.4                      | 2.55                                       | .260 | .147 |
| B       | 0                         | 1.27                                       | .248 | .062 |
|         | 11.4                      | 2.97                                       | .281 | .143 |
| C       | 0                         | 0.63                                       | .226 | .031 |
|         | 8.8                       | 1.65                                       | .237 | .087 |
| D       | 0                         | 3.71                                       | .273 | .201 |
|         | 10.0                      | 5.75                                       | .319 | .322 |
| E       | 0                         | 0.64                                       | .247 | .036 |
|         | 14.2                      | 4.03                                       | .273 | .147 |
| G       | 0                         | 1.41                                       | .242 | .076 |
|         | 10.6                      | 3.26                                       | .274 | .178 |
| I       | 0                         | 2.87                                       | .279 | .147 |
|         | 16.0                      | 4.57                                       | .309 | .232 |
| J       | 0                         | 0.71                                       | .262 | .031 |
|         | 11.4                      | 1.04                                       | .299 | .051 |
| K       | 0                         | 1.44                                       | .248 | .118 |
|         | 11.4                      | 2.40                                       | .260 | .123 |
| L       | 0                         | 2.05                                       | .248 | .114 |
|         | 7.7                       | 2.49                                       | .280 | .138 |
| M       | 0                         | 1.30                                       | .241 | .067 |
|         | 11.4                      | 2.03                                       | .262 | .100 |
| N       | 0                         | 1.46                                       | .248 | .076 |
|         | 8.7                       | 1.81                                       | .261 | .085 |



**TABLE 2.—Head Loss and Coefficients of 4-Inch Couplers in the Straight and Misaligned Positions**

| Coupler | Misalignment<br>(degrees) | Head loss in<br>equivalent<br>feet of pipe | Ks   | Kc   |
|---------|---------------------------|--------------------------------------------|------|------|
| A       | 0                         | 3.13                                       | .324 | .170 |
|         | 13.3                      | 6.92                                       | .369 | .294 |
| B       | 0                         | 3.12                                       | .307 | .134 |
|         | 11.4                      | 3.87                                       | .321 | .165 |
| C       | 0                         | 2.20                                       | .297 | .098 |
|         | 11.4                      | 4.10                                       | .336 | .196 |
| D       | 0                         | 5.75                                       | .349 | .258 |
|         | 11.4                      | 6.32                                       | .378 | .330 |
| E       | 0                         | 2.88                                       | .305 | .110 |
|         | 11.4                      | 3.21                                       | .316 | .152 |
| F       | 0                         | 3.72                                       | .327 | .165 |
|         | 11.4                      | 4.31                                       | .327 | .183 |
| G       | 0                         | 1.91                                       | .293 | .078 |
|         | 9.6                       | 4.77                                       | .337 | .201 |
| H       | 0                         | 3.95                                       | .320 | .170 |
|         | 7.6                       | 4.65                                       | .337 | .214 |
| I       | 0                         | 5.25                                       | .321 | .232 |
|         | 13.3                      | 8.14                                       | .384 | .335 |
| J       | 0                         | 1.53                                       | .292 | .071 |
|         | 13.3                      | 1.82                                       | .298 | .089 |
| K       | 0                         | 4.37                                       | .329 | .192 |
|         | 11.4                      | 5.88                                       | .374 | .236 |
| L       | 0                         | 3.45                                       | .320 | .126 |
|         | 7.5                       | 4.95                                       | .323 | .170 |

**TABLE 3.—Head Loss and Coefficients of 5-Inch Couplers in the Straight and Misaligned Positions**

| Coupler | Misalignment<br>(degrees) | Head loss in<br>equivalent<br>feet of pipe | Ks   | Kc   |
|---------|---------------------------|--------------------------------------------|------|------|
| A       | 0                         | 1.07                                       | .238 | .021 |
|         | 9.5                       | 2.68                                       | .255 | .071 |
| B       | 0                         | 1.44                                       | .230 | .029 |
|         | 9.9                       | 3.22                                       | .246 | .085 |
| C       | 0                         | 0.48                                       | .205 | .022 |
|         | 7.6                       | 1.10                                       | .211 | .050 |
| D       | 0                         | 3.23                                       | .247 | .072 |
|         | 11.5                      | 8.00                                       | .292 | .196 |
| E       | 0                         | 0.30                                       | .203 | .045 |
|         | 10.9                      | 1.42                                       | .234 | .064 |
| F       | 0                         | 2.11                                       | .238 | .064 |
|         | 11.4                      | 3.46                                       | .255 | .089 |
| G       | 0                         | 0.76                                       | .226 | .021 |
|         | 10.8                      | 2.53                                       | .245 | .067 |
| H       | 0                         | 1.33                                       | .230 | .014 |
|         | 11.5                      | 3.14                                       | .247 | .072 |
| J       | 0                         | 0.55                                       | .228 | .020 |
|         | 12.1                      | 1.93                                       | .242 | .054 |
| K       | 0                         | 2.08                                       | .245 | .054 |
|         | 11.2                      | 4.95                                       | .284 | .067 |
| L       | 0                         | 1.64                                       | .243 | .040 |
|         | 12.1                      | 3.25                                       | .251 | .094 |

**TABLE 4.—Head Loss and Coefficients of 6-Inch Couplers in the Straight and Misaligned Positions**

| Coupler | Misalignment<br>(degrees) | Head loss in<br>equivalent<br>feet of pipe | Ks   | Kc   |
|---------|---------------------------|--------------------------------------------|------|------|
| A       | 0                         | 5.45                                       | .268 | .085 |
|         | 10.9                      | 6.72                                       | .276 | .103 |
| B       | 0                         | 1.87                                       | .252 | .039 |
|         | 13.4                      | 6.60                                       | .299 | .152 |
| C       | 0                         | 1.62                                       | .232 | .037 |
|         | 12.1                      | 2.44                                       | .256 | .063 |
| D       | 0                         | 6.90                                       | .286 | .157 |
|         | 5.3                       | 8.35                                       | .303 | .214 |
| E       | 0                         | 1.35                                       | .235 | .030 |
|         | 9.3                       | 2.78                                       | .252 | .083 |
| F       | 0                         | 2.44                                       | .246 | .050 |
|         | 10.0                      | 2.80                                       | .259 | .052 |
| G       | 0                         | 2.14                                       | .246 | .034 |
|         | 9.0                       | 4.40                                       | .266 | .110 |
| H       | 0                         | 2.14                                       | .242 | .049 |
|         | 9.2                       | 3.09                                       | .255 | .074 |
| I       | 0                         | 4.65                                       | .266 | .105 |
|         | 22.6                      | 11.20                                      | .333 | .245 |
| J       | 0                         | 2.38                                       | .249 | .052 |
|         | 11.6                      | 3.92                                       | .262 | .072 |
| K       | 0                         | 5.05                                       | .276 | .069 |
|         | 9.6                       | 6.40                                       | .283 | .147 |
| L       | 0                         | 3.41                                       | .306 | .089 |
|         | 8.0                       | 4.32                                       | .319 | .112 |
| M       | 0                         | 1.41                                       | .229 | .027 |
|         | 10.2                      | 3.66                                       | .259 | .087 |
| P       | 0                         | 3.60                                       | .259 | .083 |
|         | 9.2                       | 3.80                                       | .259 | .087 |
| R       | 0                         | 6.00                                       | .283 | .134 |
|         | 7.6                       | 6.40                                       | .286 | .152 |

**TABLE 5.—Average Ks and Equivalent Feet of Pipe of Couplers of the Same Size\***

| Diameter | Ks   | Variation from<br>mean average | Equivalent<br>feet of pipe |
|----------|------|--------------------------------|----------------------------|
| 3 inches | 0.25 | 0.046                          | 1.47                       |
| 4 inches | 0.31 | 0.051                          | 3.15                       |
| 5 inches | 0.23 | 0.044                          | 1.58                       |
| 6 inches | 0.26 | 0.052                          | 3.35                       |

\*Averages based on couplers where all four sizes were of the same type.

## DISCUSSION

As pointed out earlier, couplers B and P are the only couplers tested that do not have a riser outlet. The internal structure of the two couplers is different. Coupler B has a large opening around the pipe ends, allowing for a greater misaligned position. Coupler P restricts the pipe ends to a fixed position. Both couplers in the 6-inch size and in a straight position have approximately the same loss ( $K_s = 0.25$  and  $K_s = 0.26$ ). Coupler P was tested in the 6-inch size only.

Couplers F, K, and N were the only double end couplers with a riser outlet. The internal construction of the three is similar. In all three couplers the distance between the pipe ends may vary, depending on how they are installed. This could cause differences in head loss. All three were tested in the 3-inch size, and show approximately the same head loss,  $K_s = 0.24, 0.25, 0.25$ . Couplers F and K in the 4-inch size have a  $K_s = 0.33$  and  $0.33$ ; in the 5-inch size,  $K_s = 0.24$  and  $0.24$ . These results show the similarity of the internal construction of couplers F, K, and N.

Couplers I, R, and L fasten rigidly to one end of the pipe, by bolting on. The difference in the couplers is in the method of connecting the other pipe end. Coupler I has the male part of the coupler attached to the other pipe end. Coupler R uses a male gasket and external latch. Coupler L uses only a latch, with the pipe end extending into the coupler. Each of these couplers was tested in the 6-inch size, with  $K_s$  values of 0.27, 0.31, and 0.26. The internal structure of the three couplers is different, and this makes comparison difficult.

The remaining group of couplers, H, E, A, J, M, C, G, and D, are single end couplers. However, a difference in the internal surface and structure produces a different head loss. Table 6 shows the  $K_s$  value of this group.

Coupler D, the only coupler tested with a 3-inch riser outlet, has the largest head loss of all the couplers tested.

Couplers D and H in the 4-inch size were tested with the pipe ends in different positions. This could be done since there is no defined position of the pipe ends within the coupler. The tests were made

**TABLE 6.— $K_s$  Values of Single End Couplers of Different Sizes**

| Coupler | $K_s$  |        |        |        |
|---------|--------|--------|--------|--------|
|         | 3-Inch | 4-Inch | 5-Inch | 6-Inch |
| H       | . .    | .32    | .23    | .24    |
| E       | .25    | .31    | .20    | .24    |
| A       | .25    | .32    | .24    | .27    |
| J       | .26    | .29    | .23    | .25    |
| M       | .24    | . .    | . .    | .23    |
| C       | .23    | .30    | .21    | .23    |
| G       | .24    | .29    | .23    | .25    |
| D       | .27    | .35    | .25    | .29    |
| Average | .25    | .31    | .23    | .25    |

**TABLE 7.—Ks Values of Two Couplers with Pipe Ends Placed Together and Apart**

| Coupler | Distance between pipe ends | Alignment position | Ks   |
|---------|----------------------------|--------------------|------|
| D       | 0                          | 0°                 | 0.28 |
| D       | 3"                         | 0°                 | 0.35 |
| D       | 0                          | 3.8°               | 0.28 |
| D       | 3"                         | 5.7°               | 0.38 |
| H       | 0                          | 0°                 | 0.28 |
| H       | 3"                         | 0°                 | 0.32 |
| H       | 0                          | 2.9°               | 0.29 |
| H       | 3"                         | 3.8°               | 0.34 |

**TABLE 8.—Effect of Coupler Size on the Coefficient Ks**

| Diameter | Coefficient Ks of Couplers |     |            |
|----------|----------------------------|-----|------------|
|          | A                          | G   | Avg. of 10 |
| 3"       | .25                        | .24 | .25        |
| 4"       | .32                        | .29 | .31        |
| 5"       | .24                        | .25 | .26        |
| 6"       | .27                        | .25 | .26        |

when the pipe ends were placed together within the coupler, and when the pipe ends were positioned apart so the riser outlet could be used. Results are shown in Table 7.

The results with couplers D and H show the effect of the distance between pipe ends within the coupler. The closer together the pipe ends, the smaller the head loss becomes.

The test also shows that size of coupler has an effect on the coefficient. Results with two different types of couplers and the average of 10 different types of couplers are shown in Table 8. All the couplers show a higher head loss in the 4-inch size, with a low in the 3-inch size. This is in line with the results reported by H. M. Olson (2). In 1950 after testing one coupler in three sizes, he reported that coupler coefficient increased with velocity and that the coupler had a different coefficient for each pipe size. (His results showed  $K_c = 0.11$  for 3 inches,  $K_c = 0.15$  for 4 inches,  $K_c = 0.05$  for 5 inches.)

L. S. Willardson (4) in 1955 also showed size to be a factor of the friction coefficient. His results were based on tests with three couplers of 3-inch and 4-inch sizes.

Gray, Levine, and Bogema (1) tested 14 different 3-inch quick couplers. Tests were made with the couplers in aligned positions and misaligned positions. The coefficient was found to vary with the design of the coupler. For the couplers in the aligned position,  $K_c$  varied from 0.15 to 0.70.

In this study a visual inspection was made of the internal construction of each coupler. Except for two types, no difference could be detected in the internal construction of couplers of the same type but of different sizes. One of these two types was coupler A, in which the 4-



inch size has more abrupt changes in the contour lines than the other sizes have. Coupler E has a rougher internal surface in the 3-inch size than in the other sizes. These differences are probably due to the different molds and have no appreciable effect on the head loss coefficient.

## SUMMARY AND CONCLUSIONS

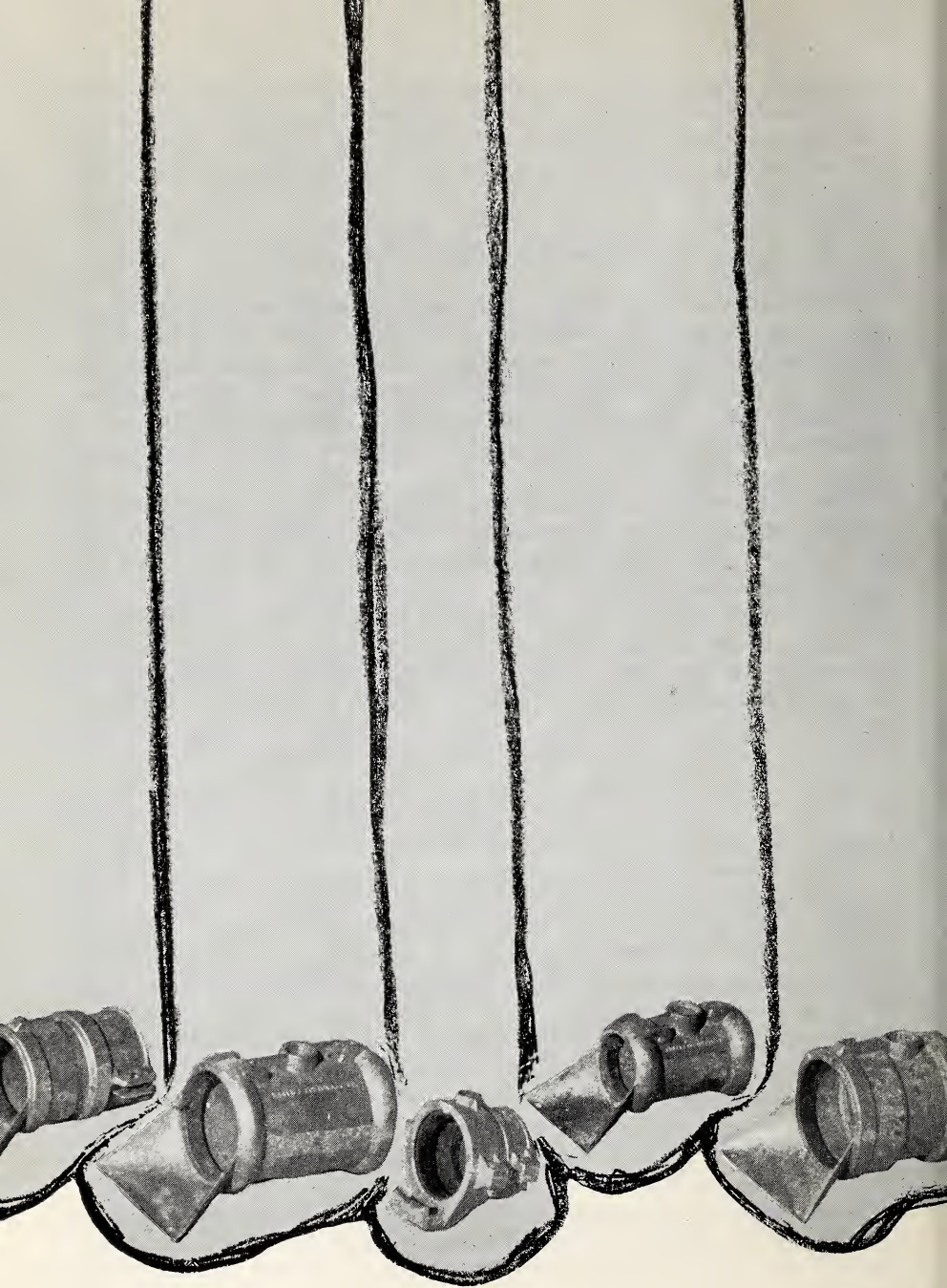
Head loss was determined on 16 different types of irrigation pipe quick-couplers, most of which were tested in 3-, 4-, 5-, and 6-inch sizes. Results of the test for each coupler are presented in three forms. One form is by expressing the loss of the coupler as loss of equivalent feet of straight pipe. The other forms are coefficients  $K_s$  and  $K_c$ , which can be used in empirical formulas for determining the total friction loss of an irrigation system.

The head loss value varies considerably, and depends on the type of coupler, the size of pipe, the alignment of the pipe joined in the coupler, the distance between pipe ends in the coupler, and the velocity of the flow through the coupler.

The known head loss in the different couplers will be valuable in the future design of quick-couplers. The head loss per coupler will also be useful when designing irrigation systems. For maximum efficiency of an irrigation system the design coefficient should be the coefficient of the coupler to be used.

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# *Chrysanthemums*

By

T. E. Pope, C. S. Blackwell,  
R. H. Hanchey and W. D. Kimbrough



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LOUISIANA STATE UNIVERSITY  
AND AGRICULTURAL AND MECHANICAL COLLEGE  
AGRICULTURAL EXPERIMENT STATION  
Charles W. Upp, Director

TECHNOLOGY AND SCIENCE ROOM

# *Chrysanthemums*

**T. E. Pope, C. S. Blackwell, R. H. Hanchey  
and W. D. Kimbrough**

The chrysanthemum is one of the most popular flowers grown in the United States. It is a very important commercial flower and is also quite frequently grown around the home. It normally blooms in the fall, for it is what is known as a "short day" plant. However, by regulating shading and lighting to adjust day length, commercial growers now produce chrysanthemums the year around.

In south Louisiana chrysanthemums are commercially important especially at one particular time of the year, and that is All Saints' Day (November 1). Fortunately many varieties are normally in bloom at that time. Many growers produce flowers for this occasion only. In such cases it is imperative that blooms be ready for sale within a week prior to All Saints' Day. Otherwise the demand for them would be very limited.

Chrysanthemum flowers have good lasting qualities as cut flowers, pot plants and on the plants grown outdoors. There is a wide range in color of flowers among varieties. Flower form is also quite variable, with the following being the main ones: single or daisy, pompon, decorative, cushion, anemone, spider, spoon and quill. Some of these types are illustrated in Figure 1. The size of blooms varies from small to very large, this being determined by the variety and to some extent by the amount of disbudding practiced. The height of plant will vary from about one foot to over six feet, depending on variety, cultural conditions and disbudding. The varieties are divided into general groups, according to the time of blooming. Thus there are 7-, 8-, 9-, 10-, 11-, 12-, 13- and 14-week varieties. This grouping is determined in general by the time required for the plants of a variety to bloom after being exposed to lighting conditions favorable for flower bud formation. This of course means that the fewer the weeks, the earlier the variety. However, climatic conditions have some influence on the time of bloom; thus the time grouping is not specific.

This bulletin was written to meet the demand for information concerning chrysanthemum culture. It is divided into three parts: (1) production of standard or large flowers that have one bloom per stem; (2) mums for the yard; (3) forced disbuds and other pot mums.

New varieties of chrysanthemums are produced from seed or from mutations or sports of existing varieties. Varieties will not come true from seed. In general, plants of varieties are commercially propagated from cuttings. This method is recommended as the best one. The cuttings root readily in any good medium under favorable conditions. Plants may also be increased by using the stolons that form around the base of the plant or by dividing the



crowns of older plants. The latter methods are more favorable to the spread of diseases but are often used by home gardeners.

## **PRODUCTION OF STANDARD MUMS**

The term "standard chrysanthemum" refers to the types that generally have very large flowers on long stems. There is only one bloom per stem and one to four stems per plant.

### **Location and Preparation of the Bed**

The bed should be in full sun, and the drainage of the soil must be excellent. It should be fairly level so as not to make irrigation too much of a problem. The soil should be well prepared sometime in advance of transplanting the plants. Organic matter such as manure, leaf mold or peat should be worked into the soil. The soil should be treated with methyl bromide, Vapam or Mylone to reduce plant diseases, nematodes and weeds and grass. When using these materials, directions as given by the manufacturers should be followed. Methyl bromide is more effective than the others but is more difficult to apply. If steam is available it may be used to pasteurize or sterilize the soil. Fertilizer at the rate of about 3 pounds of 8-8-8 or equivalent per 100 square feet should be broadcast over the bed and worked into the soil about 10 days before the plants are to be set out.

The same location may be used over and over if it is treated and the organic content replenished each time before it is planted. The soil should not be allowed to become compact.

### **Obtaining Plants**

It is of course possible for the grower to propagate his own plants from cuttings if suitable stock plants are available. This procedure is not recommended, however, because of the likelihood of the presence of diseased plants. It is generally best to obtain plants from a reliable wholesale grower or from a retail source that obtains plants from such a company. These companies specialize in propagating plants. They have trained personnel that see to it that disease is reduced to a minimum and that excellent plants are produced and reach the grower in good condition. Plants may be ordered to arrive at approximately any designated date, if orders are received by the propagator sufficiently ahead of time.

### **Transplanting**

The time of transplanting is of considerable importance. The time greatly affects the height of plants but has little to do with the time or size of bloom unless the plants are set very late. There is no advantage to early planting, as that means only that care is necessary for a longer period of time, the plants will grow taller than necessary and the lower leaves will likely be lost. The effect of date





**FIGURE 1.**—Some types of chrysanthemums. A, single; B, anemone; C, spoon; D, spider; E, pompon; F, decorative; G, standard.

of planting on length of stems and size of blooms is shown in Table 1. The data show that height varied directly with the date of planting. This was not true for flower size, though flowers of the later plantings of the Betsy Ross tended to be a little smaller. It would seem that about June 15 is the best time to set plants in south Louisiana for mums for All Saints' Day. (See Figure 2.) Stems three to four feet in height are long enough.

Plants should be removed from the packages and transplanted as soon as received. They will normally arrive in excellent condition. If it is possible to do so, there is some advantage to setting plants in peat pots and letting them stay for about a week before they



**FIGURE 2.**—Effect of planting date on plant growth of two varieties of chrysanthemums, Betsy Ross on the left and Yellow Ambassador on the right. Planting dates were, from left to right, June 2, 16, 30, July 14 and 28.

are set out in a permanent location. This will add to the expense but should help get the plants off to a good start and reduce losses. The soil should be in good condition when plants are transplanted, and they should be watered at that time and loose soil then put over the wet soil. It is beneficial to set bare rooted plants on cloudy days or in late afternoon. In beds, the plants should be spaced one foot apart each way. If grown on rows, they should be set one foot apart.

## Varieties

The variety or varieties of mums grown, as with most other crops, will largely determine the success of the undertaking. Numerous varieties are on the market and new ones are being added every year. Varieties must produce blooms at a time when there is

**TABLE 1.—The Effect of Date of Planting on Length of Stems and Size of Blooms**

| Variety                    | Planting Date | Measurement in Inches |          |       |      |
|----------------------------|---------------|-----------------------|----------|-------|------|
|                            |               | Stem Length           | Diameter | Depth |      |
| Yellow Ambassador          | June          | 2                     | 46.5     | 3.7   | 2.2  |
|                            |               | 16                    | 42.0     | 4.4   | 3.2  |
|                            |               | 30                    | 34.5     | 4.2   | 2.3  |
|                            | July          | 14                    | 25.0     | 3.3   | 2.0  |
|                            |               | 28                    | 19.5     | 3.8   | 1.8  |
| Average, Yellow Ambassador |               |                       | 33.5     | 3.9   | 2.3  |
| Betsy Ross                 | June          | 2                     | 60.0     | 5.7   | 2.4  |
|                            |               | 16                    | 57.5     | 5.5   | 2.4  |
|                            |               | 30                    | 46.0     | 5.6   | 2.4  |
|                            | July          | 14                    | 41.5     | 5.2   | 2.1  |
|                            |               | 28                    | 33.5     | 5.0   | 1.9  |
| Average, Betsy Ross        |               |                       | 47.7     | 5.4   | 2.2  |
| Average, Both Varieties    |               |                       | 40.6     | 4.65  | 2.25 |

D Values for Comparisons

|              |               |        |
|--------------|---------------|--------|
| Stem length: | (1) Varieties | = 1.15 |
|              | (2) Dates     | = 1.50 |
| Diameter:    | (1) Varieties | = 0.24 |
|              | (2) Dates     | = 0.32 |
| Depth:       | (1) Varieties | = 0.18 |
|              | (2) Dates     | = 0.24 |

a market demand. The main preference in Louisiana is for white mums, with yellow being the next most important color. There is a limited sale for so called pinks, reds and bronze colored. The spider types, while often very beautiful, are still more or less novelties.

Over the years a number of varieties have been tested here at the Experiment Station, but of course there are many that have not been tried. So far Giant Betsy Ross has proved to be the best white. Silver Sheen has been the next best white but it has not compared favorably with Giant Betsy Ross. No really satisfactory yellow has yet been tried. Good News and Mrs. Kidder have been as good as any. Improved Indianapolis Yellow has a soft yellow color and is very pretty but it is not as vigorous as might be desired. A recent introduction, Giant No. 4 Indianapolis Yellow, appears to be worthy of trial. Another relatively new yellow variety, Ranier, has shown promise in tests here.

Growers should probably stay with varieties that they have been successful with or that have done well in the area where they are to be grown. New varieties should be tried only on a small scale until they have been proved to be successful.

## Pinching and Disbudding

When the plants have been in a permanent location for about 10 to 14 days, the terminal or top of the plant should be removed. This is called pinching. Lateral shoots, called breaks, will then be



forced out. The number of breaks to be allowed to grow per plant should be decided upon and the others, if any, removed. Usually two to four shoots per plant are left, depending to some extent on the variety and spacing. From then on all side buds on all shoots should be kept removed. This requires continuous, tedious, careful work.

Leaves must not be damaged when the disbudding is done. If the terminal bud should be injured, a side bud near the top of the stem may be allowed to take its place. This is likely to cause an angle in the stem, and if it occurs late in the season the bloom may be a little late.

Probably because of environmental conditions, the terminal flower bud may develop into what is called a crown bud. This is a rough-looking bud, and until the last few years it was thought that this type of bud would not make a good flower and should be removed. It is now known that a high percentage of the crown buds will produce good flowers and it is now recommended that they be allowed to bloom. Here at the Experiment Station observations over a period of years have shown that it is the rare exception when a bloom from a crown bud can be easily distinguished from one from a normal bud.

## **Support**

From the time they are small plants until the blooms are cut, standard chrysanthemums must receive support. This is to keep them from falling over and to keep the stems as straight as possible. This is usually done by stretching wire down the rows of plants and tying each individual shoot to the wire. This will mean a series of wires starting about six inches from the ground and added at intervals of about a foot until the plants are grown. Strong posts or metal pipe frames have to be at the ends of the rows to which to fasten the wires. Each shoot must be tied to each wire. This is a painstaking, time-consuming job. A new type of support is now being used for plants grown in beds. It is a special 6 x 6 inch mesh woven-wire material similar to a woven-wire fence. There must be supports at the ends of the bed to which the wire may be attached. The material is stretched over the bed when the plants are small and raised as the plants grow. This eliminates the tying of shoots during the growing season and the cutting of strings at harvest time.

## **Fertilizing**

Fertilizer is applied to make up for nutritional deficiencies that occur in the soil. All chrysanthemums grown commercially in Louisiana receive fertilizer of some sort. Since chrysanthemum plants must not be stunted, but should grow continuously, it is best that needed nutrients be available at all times. Fertilizer is a relatively small part of the cost of growing mums. Therefore it is better to

apply more than necessary rather than too little, as long as no damage is done. Even so, it is believed that the average grower applies more fertilizer than he should. As long as plants are growing well and the foliage has good color, fertilizer is not a limiting factor.

Fertilizer applied just prior to the opening of blooms is wasted. A fertilizer test conducted with chrysanthemums at the Experiment Station showed little difference in growth or flower production between plants that received all of the fertilizer at the start of the experiment and those that were fertilized at various intervals.

The amount of fertilizer needed will vary with the type of soil, the amount of rainfall and irrigation. It is suggested that 3 pounds of 8-8-8 or equivalent be applied per 100 square feet or 100 feet of row. On sandy soils this amount may be repeated at monthly intervals for three applications. On silt soils nitrate of soda, or equivalent, may be applied at rates of 1.5 pounds per 100 feet of row per month if needed.

## **Irrigation**

Moisture conditions will likely have more to do with successful growing of chrysanthemums than any other factor. Again it is pointed out that good drainage is absolutely necessary. In a location where plants may normally be grown without difficulty, they may be lost during periods of excessive rainfall. This happened during the past season. When drainage is not a factor, the lack of sufficient water at certain times becomes important. Not enough water will definitely slow or stop growth. This should not be allowed to happen with chrysanthemum plants. Water for irrigation must be available, and it should be applied when needed and without delay.

The soil should be thoroughly soaked each time water is applied. Water should be kept off the foliage as much as possible. It is especially important for plenty of water to be available at the time the blooms are opening.

## **Protection**

When the flowers start to open some protection is usually necessary. This is often supplied by a light muslin material, which of course must be supported above the flowers. The material will prevent beating rains from damaging the flowers, especially white ones, and will protect against light frost. It also will reduce the amount of dust residues on the flowers.

In some cases plastic greenhouses have been used to grow chrysanthemums. The plastic should not be put on the houses until about time for blooms to open, and the sides should be left open for ventilation. Fans may be used to improve ventilation, if necessary. When the humidity is continuously high disease problems are increased. At the Experiment Station at Baton Rouge chrysanthemums have been successfully grown in a plastic screen house for a



number of years. The screen reduces the intensity of the sunlight about 20 per cent, and that is beneficial during the summer. The screen also breaks the hard rains, but does not give as much protection as muslin.

## **Harvesting and Marketing**

To supply the important market of All Saints' Day the mums must be ready a few days prior to November 1. After maturity the flowers will hold for about 10 days, depending a little on variety. If cold storage is available flowers may be kept for as long as two weeks at 35° to 40° F. Storage, even if available, means additional expense. Blooms should be cut with stems as long as the market demands. Three feet should usually be more than enough. Immediately after the flowers are cut the stems should be placed in water.

There is considerable expense and a lot of work involved in growing standard chrysanthemums. Before it is undertaken there should be a reasonable assurance of a market for the product. If the chrysanthemums are well grown and profitably sold, it is a worthwhile enterprise. Many growers are supplementing their incomes in this manner. As with all perishable products, however, if the market is flooded, the growers do not profit.

## **CHRYSANTHEMUMS FOR THE YARD**

Chrysanthemums are very popular plants for many home gardeners in the state. They add a great deal of color to the landscape for a period of about 10 weeks in the fall if a series of early to late varieties are planted. Usually the so-called pompon varieties are grown. This is a misnomer, as the pompon is one type and, as mentioned in the introduction, there are many types. The flowers vary in size but the largest are much smaller than standards. They are not disbudded but are allowed to produce a profusion of blooms. Some varieties, if given enough space, will produce uniformly shaped plants covered with blooms. However, they are often not too good for cut flowers. Other varieties produce taller more straggly plants and sprays of flowers that are excellent for cutting.

The spray types are grown to some extent commercially as cut flowers in Louisiana. In some areas, such as in Florida, they are of considerable commercial importance. They are a lot less trouble to grow than are standards. Standard varieties are sometimes grown in yards without disbudding but in general are not too satisfactory.

## **Location**

Well-drained locations with as much exposure to the sun as possible should be selected. Chrysanthemum plants will thrive on a wide range of soil types, but the soil should have a relatively high organic matter content. It should be in such condition that it will not become compact. Mums should not be allowed to grow year

after year in the same location, for, if so, they will deteriorate badly. This usually happens even the second year. For this reason it is best to change the location of the chrysanthemum planting every year. If the plants are taken out and the soil worked up, treated, fertilized, etc., they can often be reset in the same location. However, moving is often easier.

## **Plants**

In many yards plants are carried over from year to year. To start a planting of chrysanthemums or to get new varieties plants may often be obtained from friends. This is usually done by using stolons that form at the crown of old plants. Only the outer stolons should be used, as the center ones are more likely to be diseased. The stolons are usually transplanted in early spring. Disease is always likely to be a problem when this is done. This also means that the plants will occupy space in the yard and require attention the year around. Mums are mainly attractive only when they are in bloom. The longer plants are left in a place, the more difficult it is to control diseases, and badly diseased plants are not attractive and do not produce very well.

As with plants of the standard type, it is recommended that plants be bought from a reliable source. Plants that have been stunted and allowed to harden will not grow as they should. Plants should be transplanted as soon as possible after they are obtained. In Louisiana the plants should be set out about the first of June. Where it can be afforded, new plants should be bought every year. If this is done the plants would occupy space in a yard for only about six months out of the year, and there should be less trouble from disease.

Plants should be spaced from one to two feet apart in the row or bed, depending on the potential spread of the plants. There is considerable varietal difference in vigor and extent of plant growth.

## **Varieties**

The selection of varieties of chrysanthemums, as with most other plants, is of considerable importance. They should be chosen from those that will do well in the area where they are to be grown. Individual preference should usually be a deciding factor. As with other commodities, some of the desired varieties may not always be available. The important propagators carry a large number of varieties but they can not handle them all. Some of the old standby varieties are nearly always available. Breeding work continues and new varieties are being introduced. Some of these are improvements over older similar varieties and will replace them. This means that the variety situation is continually changing. Local retailers can not often carry a large number of varieties. If garden club members would order together they would come nearer getting what they want than on an individual basis. Orders should be placed in plenty of time to insure delivery when desired.

The blooming period may be extended by planting varieties that produce flowers at different times. Extreme earliness in a variety is not always a benefit, for if the plants bloom when the temperatures are still very high, the flowers will not last long and those with color will fade badly. If mums are being grown for sale, the sprays must be ready when there is a ready market.

Many varieties have been grown in plots at the Experiment Station over a period of 13 years. A list of most of them follows.

|                  |                       |                   |
|------------------|-----------------------|-------------------|
| Adagio           | Frolic                | Nobility          |
| Aglow            | Fuchsia Fairy         | Nokomis           |
| Alert            | Gaiety                | Norona            |
| Ann Ladygo       | Gardenia              | Nuggets           |
| Argonne          | Gem                   | Oregon            |
| Astoria          | Glamour               | Ostosa            |
| Avalanche        | Gold Coast            | Paradise          |
| Aviator          | Golden Herald         | Paragon           |
| Ballerina        | Goldrush              | Pilgrim           |
| Beauregard       | Halo                  | Pink Dot          |
| Benora           | Horizon               | Pinkette          |
| Blizzard         | Humdinger             | Polaris           |
| Bluechip         | Huntsman              | Portrait          |
| Bonfire          | Ill. Accent           | Pristine          |
| Bonnie           | Ill. Bonbon           | Profile           |
| Bonnaffon Deluxe | Improved Bronze Daisy | Purple Waters     |
| Bright Forecast  | Improved Red Daisy    | Radiance          |
| Bronzechip       | Inca                  | Rajah             |
| Bronze Daisy     | Incurved Delaware     | Raspberry Ice     |
| Bronze Dot       | Jackpot               | Red Daisy         |
| Buccaneer        | James Stewart         | Red Humdinger     |
| Buckskin         | Jessamine Williams    | Red Velvet        |
| Caravan          | Jessie                | Remember Me       |
| Calumet          | Jetfire               | Remembrance       |
| Carmelita        | Joybringer            | Resolute          |
| Carmine Queen    | Kings Ransom          | Reward            |
| Carnival         | Larry                 | Ronnie            |
| Cecelia          | Lassie                | Rubaiyat          |
| Chalk Cliff      | Laughter              | Satin             |
| Chas. Nye        | Lee-Ette              | Schn. Yel. Daisy  |
| Cris. Columbus   | Lee Powell            | Sea Gull          |
| Chiquita         | Lemonade              | Serenade          |
| Classic          | Lillian Doty          | Silverplate       |
| Climax           | Lipstick              | Snowclad          |
| Coralhue         | Luna                  | Snow Crystal      |
| Criterion        | Luxury                | Spellbound        |
| Cupid            | Maestro               | Stardust          |
| Dark Calumet     | Magician              | Sunburst          |
| Delaware         | Mary Hall             | Sunray            |
| Diamond          | May Fair              | Sunup             |
| Dolli-ette       | Minn. Pink            | The Titan         |
| Dream Girl       | Mirth                 | Topflight         |
| Echo             | Mischief              | Toronto           |
| Elizabeth Hood   | Mona                  | Treasure          |
| Fanfare          | Monty                 | Venoya            |
| Firecracker      | Moonlight             | Wagonwheels       |
| Firefly          | Morrocco              | Waltz Time        |
| Fred Yule        | Navaho                | White Candle Glow |

White Doty  
White Popcorn  
Whitecap  
Wilson's White

W. P. Snyder  
Yellow Calumet  
Yellow Delaware  
Yellow Dot

Yellow Doty  
Yellow Ill. Snowdrift  
Yellow Spoon

The varieties that have been the better ones in the experimental plots and some of their characteristics are shown in Table 2.

**Table 2.—List of the Better Varieties With Some of Their Characteristics**

| Variety            | Response Group | Color of Bloom | Height of Plant | Type of Flower  |
|--------------------|----------------|----------------|-----------------|-----------------|
| Aviator            |                | Bronze         | Med             | Pompon          |
| Beauregard         | 10 wk          | Red            | Med             | Pompon          |
| Bonfire            | 8 wk           | Red            | Med             | Decorative      |
| Bronze Daisy       | 9 wk           | Lt. Bronze     | Med             | Single or Daisy |
| Bronze Dot         | 9 wk           | Bronze         | Tall            | Pompon          |
| Caravan            | 7 wk           | Salmon Bronze  | Med             | Decorative      |
| Classic            | 7 wk           | White          | Tall            | Pompon          |
| Coralhue           | 7 wk           | Coral          | Small           | Pompon          |
| Dolli-ette         | 7 wk           | Golden Bronze  | Med             | Spoon           |
| Dream Girl         | 7 wk           | Lt. Lavender   | Tall            | Pompon          |
| Firecracker        | 7 wk           | Bronze         | Tall            | Decorative      |
| Fuchsia Fairy      | 7 wk           | Lt. Pink       | Small           | Decorative      |
| Gardenia           | 8 wk           | White          | Med             | Large Pompon    |
| Golden Herald      | 9 wk           | Yellow         | Tall            | Decorative      |
| Humdinger          | 10 wk          | Purple         | Small           | Pompon          |
| Jessamine Williams | 7 wk           | White          | Med             | Spoon           |
| Jessie             | 9 wk           | Pink           | Med             | Pompon          |
| Joybringer         | 7 wk           | Salmon Rose    | Small           | Pompon          |
| Lee-Ette           | 8 wk           | Silver Bronze  | Med             | Dbl. Spoon      |
| Lillian Doty       | 9 wk           | Lt. Pink       | Tall            | Large Pompon    |
| Lipstick           | 7 wk           | Red            | Small           | Cushion Pompon  |
| Maestro            | 7 wk           | Cream          | Small           | Pompon          |
| Mirth              | 8 wk           | Pink           | Small           | Daisy           |
| Mischief           | 7 wk           | Purple         | Small           | Daisy           |
| Morrocco           | 7 wk           | Red            | Med             | Decorative      |
| Pink Dot           | 9 wk           | Pink           | Tall            | Pompon          |
| Portrait           | 10 wk          | Lavender       | Med             | Pompon          |
| Profile            | 10 wk          | Pink           | Med             | Large Pompon    |
| Red Daisy          | 9 wk           | Red            | Med             | Single or Daisy |
| Red Velvet         | 7 wk           | Crimson        | Med             | Decorative      |
| Remember Me        | 7 wk           | Bronze         | Tall            | Single          |
| Sea Gull           | 9 wk           | Ivory          | Med             | Pompon          |
| Spellbound         | 7 wk           | Lavender       | Med             | Decorative      |
| Toronto            | 7 wk           | Bronze         | Med             | Decorative      |
| Treasure           | 7 wk           | Yellow         | Tall            | Pompon          |
| Wagonwheels        | 9 wk           | Silver Coral   | Tall            | Anemone         |
| White Doty         | 9 wk           | White          | Tall            | Large Pompon    |
| Yellow Dot         | 9 wk           | Yellow         | Tall            | Pompon          |
| Yellow Doty        | 9 wk           | Yellow         | Tall            | Pompon          |

## Care

When plants are four to six inches tall, depending on the varietal vigor, they should be pinched. Pinching means removing the terminal or top of the plant, leaving four to five leaves. This will cause



more breaks and more profuse bloom on less straggly plants. The plants of many varieties are low to medium in height, compact and need no staking. Others such as the Dots and Dotys are fairly tall and need some support or they will fall over badly. It is easier to give support along the sides of the rows rather than to individual plants.

If complete fertilizer was applied before setting the plants additional nitrogen may be all that is needed, except on very sandy soils. This may be applied as nitrate of soda, or equivalent, at the rate of 2 pounds per 100-foot row once or twice during the growing season. The growth of the plant and color of the foliage will give an indication of the need of additional fertilizer.

There are almost certain to be periods of drouth during the growing season. Since chrysanthemums should be kept growing continuously, it is essential that plants be irrigated when lack of water would stunt them. Plants should receive light cultivation after heavy rains, especially on soils that tend to pack. Of course weeds and grass should be controlled.

Insects and diseases will also require attention. These are discussed in the latter part of this bulletin.

## **Growing from Seed**

If blooms are not cut and plants remain healthy, some varieties will produce viable seed. These seed may be planted and plants produced. If the seed are planted in a greenhouse or hotbed in late winter, normal plants and blooms will be obtained the following fall. In general, plants will not come true from seed, and seedling plants are quite variable. Some may be quite similar to parents. Desirable seedlings may be selected and propagated by cuttings.

For several years hundreds of seedling plants have been grown on experimental plots at Baton Rouge. Several promising selections have been made, but so far none has been released. Most of the selections have been of the cushion type and are quite showy. Disease is always a problem in the propagation and maintenance of selections.

## **GREENHOUSE CHRYSANTHEMUMS**

Chrysanthemums are the most important flower crop produced in the United States. The real increase in chrysanthemum production began as growers undertook to produce year-round flowering—and as the public accepted it. Today more than half of all mums grown are made to flower “out of season” by being either shaded or lighted to get proper growth and bud set. Many mums are grown and sold as disbud plants in pots. Some of these are produced in Louisiana.

## **Soil**

Whether plants are grown as pot plants or in benches, it is essential that the soil have a loose open texture. This can be ob-

tained by the addition of organic matter to any reasonably good field or garden soil. Good soil drainage is of utmost importance, for root growth is retarded in poorly aerated soils. The organic matter, in the form of peat moss or well-rotted manure, should be added at no less than one-fourth by volume; when heavy soil is used, increasing this amount to one-third should prove beneficial. For pot mums, however, it is necessary to add broken pottery, gravel or some similar material to the bottom of the pot to facilitate drainage.

Prior to planting, the soil should be treated to kill disease organisms, insects and weed seed. Steam is probably the most satisfactory method to use for greenhouse purposes. If steam is not available, certain chemicals such as methyl bromide, Vapam, Mylone and others can be used.

Chrysanthemums grow best in a soil that has a pH of 6.0 to 7.0. Stunting and chlorosis of plants may occur when the soil pH is unsatisfactory. Too much water or fertilizer in the soil may interfere with normal functioning of the roots and also produce chlorosis in the upper leaves. Mums can be grown one plant to a 3½-inch pot, two plants to a 4-inch pot, three to four plants to a 5-inch pot, and up to six or more plants to larger pots. Whether they are to be grown as pinched or unpinched plants also is a factor determining the number of cuttings to be placed in the pot. When pinched there may be fewer plants per pot.

## **Benching or Potting**

Usually rooted cuttings are spaced 8 by 8 inches in the bench. If the mums are to be grown single stemmed, closer planting can be practiced. The cuttings should be planted just deep enough to keep them from falling over when first watered. Poor root growth and diseases become a problem if the cuttings are planted too deep.

With pot mums, the rooted cuttings are placed directly into the finishing pot. The plants should be watered at least twice soon after potting to insure adequately wetting the soil.

## **Fertilization**

Low fertilizer levels should be maintained until the plants are established, which is generally 10-14 days after benching or potting. Then a higher level of fertilization is maintained until the flowers show color.

Where a regular soil test is conducted on bench soil the following ranges of fertilizer are best, based on the Spurway system: nitrogen, 25-50 parts per million; phosphorus, 5 to 10 parts per million; potassium, 20 to 40 parts per million; calcium, 150 to 200 parts per million.

Since frequent soil testing is expensive and many growers do not have the proper facilities for testing available, they fertilize bench mums every two to four weeks with a high-analysis fertilizer at the rate of 1-2 pounds per 100 square feet of bench area. Of course,

the rate and frequency of fertilization should be reduced during the winter. Less leaching occurs during this time of year since watering is done less frequently. Pot mums are fertilized every 7 to 10 days from the time the plants are established until color is showing in the flower. Again, a high-analysis fertilizer is used and applied by the hoon method. In this practice a solution of 1½ pounds of 20-20-20 dissolved in 3 gallons of water is applied with a 1:15 hoon. A quarter teaspoon of a complete fertilizer such as 8-8-8 can be applied per 5-inch pot in lieu of the above practice. One-half teaspoon is used for larger pots.

Where phosphorus has been added to the soil in the bench or potting soil prior to planting, only nitrogen and potassium are generally applied. For bench mums, 3 to 5 pounds of superphosphate per 100 square feet of bench area are incorporated into the soil prior to planting. Superphosphate (20 per cent) is added at the rate of a level 5-inch pot to each 2½ bushels of potting soil. Since excess phosphorus is rarely encountered and as phosphorus is slowly available, it is best to add this material to the soil prior to planting.

Recently, the application of a dilute nutrient solution to the crop at each watering has been found to give satisfactory results, especially with pot plants.

Few growers actually depend on a soil test to determine fertilizer schedules. Generally, a regular feeding schedule is set up based on previous experience coupled with visual observation of excess or deficiency symptoms.

Visual symptoms are an invaluable aid in ascertaining the nutritional requirements of plants. A lack of nitrogen causes the entire plant to turn yellow, then bronze or brown. The plant is stunted, becomes woody, and the leaves and flowers are small. An excess of nitrogen is manifested by very dark green crisp leaves. The foliage is brittle and breaks easily. The stems also develop longitudinal cracks when an excess is present.

A yellowing of the leaf margins is characteristic of a potassium deficiency. Later the affected leaves turn brown and may drop off. Excesses of potassium, as well as nitrogen, generally result in root damage causing stunt, wilt or even death of the plant.

## Watering

Too little water results in a check of root growth and this in turn retards the over-all growth of the plant. Overwatering also causes root damage due to lack of oxygen.

When plants are benched, an initial heavy watering should be given. The soil should be watered again when indicated by soil condition. Then the waterings should be heavy enough to adequately moisten the soil. As the plants increase in size the frequency of watering will have to be increased. In hot weather plants may need watering that will thoroughly moisten the soil at frequent intervals.



Pot mums are also given an initial heavy watering and then allowed to become fairly dry before additional moisture is supplied. Plants in pots will need very frequent waterings, perhaps two times a day during very warm days.

The time flower buds show color is a critical period so far as watering is concerned. Lack of water results in damage to the expanding flower, while overwatering may injure the roots.

## **Pinching**

Pinching is practiced to induce branching of the plant. Only the top  $\frac{1}{4}$  to  $\frac{1}{2}$  inch of the plant should be removed. If the plant is pinched back too far, into hard wood, the number of breaks is reduced and growth is delayed. In general, bench mums are pinched after they have been growing for two weeks. Pot plants should be pinched anytime from 7 to 14 days after potting, depending on the growth. The proper time to make the pinch is determined by several factors, such as season of year, variety and type of chrysanthemum. For disbudded pot plants, two to three stems are allowed to develop on each of the plants in the pot.

It has been determined that plants should be pinched at a definite time in relation to time of flower bud formation. This is called "time pinching" and is used with natural or out-of-season flowering.

Pinching on the correct date generally assures pompons that have good, open sprays. When standards are correctly pinched, they generally will not produce crown buds.

The actual time for pinching is given in the catalogs of most commercial chrysanthemum plant producers. For timing and pinching of a crop, the recommendations given in these catalogs should be followed.

## **Disbudding**

Standard varieties grown in greenhouse benches should be disbudded in the same manner as those grown outdoors. A discussion of disbudding for outdoor standards is given in a previous section of this bulletin.

Small standard varieties grown as pot plants develop the best flowers when only one bud per stem is allowed to flower. Remove the side buds surrounding the central bud. Disbudding should be practiced as soon as the buds are large enough to remove conveniently. All the shoots should be disbudded at the same time if possible. Uneven flowering results when stems are disbudded at different times. This is brought about by the fact that when disbudding has been done, the remaining bud develops more rapidly; if only some shoots are disbudded, uneven flowering occurs.

With pompons no disbudding is generally practiced. Axillary shoots below the spray may begin to develop at the time it produces flowers. These should be removed when the crop is cut.



## **Light**

Moderately high light intensities are most favorable for rapid growth of chrysanthemums. However, in Louisiana, shading of the greenhouse is necessary during the summer. This is done to bring about a reduction in temperature and to reduce petal burn. Shading also makes the greenhouse a more pleasant place for working during the summer. Care should be taken not to reduce the light too much, as this causes weak spindly growth and delays the crop.

In late fall, winter and early spring little or no shading is needed in Louisiana.

## **Temperature**

In the deep South, the temperatures in the warm months are generally too high for production of best quality mums. A temperature of 60° F. at night and from 70° to 75° F. during the day is best for chrysanthemums. If the temperature is too low, below 55° F. at night, flower buds do not initiate in many varieties. On the other hand, high temperatures may cause arrested development of the flower bud.

It has also been noted that flowers of the pink, bronze and red varieties fade during periods of warm weather. It is therefore recommended that only yellow and white varieties be grown for flowering during the hot summer and early fall.

## **Day Length Control**

The chrysanthemum is a "short day" plant. This means it is usually considered to set flower buds when it is exposed to a short day (approximately 12 hours). Chrysanthemums flower naturally in the fall because conditions are favorable for bloom production at that season.

It is therefore necessary that mum plants be either shaded under long day conditions to induce flower bud set or be given additional light under short days to keep them vegetative until flower bud set is desired. To have flowering pot plants in the summer, shading is necessary to bring about flower bud formation. For the same reason, it is necessary to give mums additional light during the shorter days of the year in order to prevent flower bud formation. If this practice is not followed, flower buds form and as a result the flowers are borne on short stems and are of little commercial value.

Because of differences in day length over a year cycle, it is necessary that mums be shaded during a part of the year and given additional light at other times. Schedules for lighting and shading for different localities have been worked out, and most commercial producers of mum cuttings make these available to the grower. In general, it is recommended that these schedules be followed. Because of differences in location, it may be necessary to make adjustments in the schedule given in these catalogs. If ex-

perience shows that a certain variety is too tall, then the duration of the lighting period can be reduced. When plants are too short, more light will be needed during short days, while shading should be delayed under long days.

## Varieties

Chrysanthemums can be flowered at any season of the year. Some varieties will bloom poorly at one season but produce top quality flowers at another. For this reason mum varieties are selected on the basis of performance and are recommended for specific periods of the year. There are a few varieties that perform satisfactorily the year around.

Yellow varieties are the most popular and in some areas account for one-half of the total production. White is the next most popular color, followed by pink. Only a few red and bronze varieties are produced.

New varieties of chrysanthemums are being introduced yearly. Therefore no permanent list of varieties can be recommended. The following is a list of varieties which have proved successful in the deep South.

**Standards:** Indianapolis Yellow, Indianapolis White, Improved Indianapolis Yellow, Indianapolis No. 3 White, Anaconda, Orchid Queen, Silver Queen, Crystal, Lavender Queen, Giant Betsy Ross, Good News and Detroit News.

**Pompons:** Morty, Popcorn, Memento, Keepsake, Alaska, Seagull, No. 2 Whitechip, Acclaim, Sarasota, Gold Coast, Yellowchip, Orange Beauregard, Yellow Beauregard, Bonnaffon Deluxe, Delaware, Yellow Delaware, Lipstick, Bluechip, Shasta, Portrait, Masterpiece, Bronzechip, Red Star, Climax, Humdinger, Princess Ann, Pinkchip, Vedova and Whitetop.

## DISEASES AND INSECTS

As with all important plants, chrysanthemums are subject to a number of diseases and insects. Only the more important ones will be discussed here.

One group of diseases is caused by viruses. In this group are diseases such as mosaic, yellows and stunt. Once the plants are infected with a virus disease there is no control. To prevent spread of the disease the infected plants should be destroyed. Only disease-free plants should be planted.

Another disease that can not be controlled by fungicides is Verticillium wilt. This is a soil-borne disease. Infected plants should be destroyed. Soil treatment should be practiced to control this trouble. Fusarium wilt is a somewhat similar disease, and the same control measure should be used for it.

There are other fungus diseases that attack the leaves. These can be controlled, more or less, with the proper sprays or dusts. Sprays are, in general, more effective than dusts. Dusting is often

easier and simpler but it takes more material. Fungicides are protectives rather than cures. This means that the material should be present on the plant as nearly as possible all of the time. It is best to spray or dust at intervals of one week until the buds show color. In recent years many new spray materials have been put on the market, and other new ones are sure to make their appearance. This means that recommendations for control of pests are not fixed but likely to change.

One of the most important diseases of chrysanthemums in this area is Septoria leaf spot. Infection starts on the lower leaves and progresses upward. The leaves are discolored at the start and later dry up and fall off. Early planted standard plants have often been found to have no leaves for some distance up the stem late in the season. Yard plants left in place have often lost most of their foliage. This disease is not easy to control, although fairly good results have been obtained by spraying with Captan at weekly intervals. Ferimate, Parzate or Zerlate may also be used.

Mildew is an important disease in some areas. It causes whitish powdery places on the leaves and also causes them to be misshaped. If the disease is unchecked, the leaves will turn yellow and wither. So far this disease has not been important here. Dusting sulphur is recommended as the control for this disease. There are two materials now on the market that are effective on mildew on some plants and might be all right for chrysanthemums. These are Mildex and Acti-dione PM.

Rust is another disease that may cause some trouble. The name describes the disease very well. It occurs mostly on the underside of the leaves. So far it has not been important here. Dusting with sulphur or spraying with Ferbam should control it.

Another disease that can on occasion cause serious trouble is Botrytis. This disease usually attacks the flowers. The petals seem to be water-soaked at first and later turn brown. The infected flowers can not be marketed. Relatively high humidity favors the development of the organism. This emphasizes the importance of good aeration around the plants, which in plastic greenhouses is often difficult to accomplish. Zerlate or Parzate may be used to control the disease, but they will leave a residue on the flower. A new material called Botran is also said to be good and worthy of a trial.

Aphids have been found to be one of the most prevalent insect pests. They are often called plant lice. They are likely to attack the plants at any time and are usually found on the newer terminal growth. Aphids multiply rapidly and can quickly cause great damage if not controlled. They feed on the plant juices and must be controlled by contact insecticides or systemics. Until time for flowers to open they may be killed by Malathion, Lindane or T.E.P.P. These materials will damage petals of the flowers. Systemics, such as Systox, are effective against aphids and are especially good late in the

season when other materials can not be used. Aerosol Parathion may be used in greenhouses when handled by those experienced in its use.

Red spiders are serious pests on occasion. They will cause discoloration of leaves. They are usually more serious in greenhouses but may give trouble at times in the open or on plants covered by muslin. This pest is sometimes hard to control as it tends to develop strains resistant to specific insecticides. A number of materials are used for its control. These are Aramite, Malathion, Parathion, T.E.P.P. and Ovotran. Tedion will give very good control of eggs and young mites. Dusting sulphur may be used when the temperatures are relatively high.

Corn ear worms may cause damage by eating the flower buds. They may be controlled by spraying or dusting with DDT. It is best to prevent this damage by using the insecticide before the insect appears. Sometimes the worms are picked off and killed.

Nematodes may be a serious pest. They damage the roots, thus preventing normal growth. The root knot nematode may be detected by the knots on the roots of the plants. Soil treatment is the only control measure and at best is only temporary.

### *ACKNOWLEDGMENTS*

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B.# 555

# PRICING EGGS BY THE POUND

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Department of Agricultural Economics  
and Agribusiness

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# Pricing Eggs by the Pound

EWELL PAUL ROY<sup>1</sup>

## Introduction

Because interior quality of eggs has been steadily improved, size of eggs has now become the principal variable in consumer selection from egg displays in retail food stores. Thus, there is some interest in pricing and selling eggs by the pound. In general, pricing items by the pound has increased in favor in retail food stores. This trend is observable in the pricing of such items as apples and bananas.

## Objective of Study

The objective of this study was to compare consumer acceptance of eggs priced by the pound with eggs priced by the dozen. The total price per carton was to be held about equal for both methods in order to eliminate the effect of price differences on egg sales.

## Review of Literature

Research workers at the Rhode Island station have suggested pricing eggs by the pound as a method of eliminating consumer misinformation on egg size classes:

Consumers in this study did not receive higher quality by paying higher prices for dozens within the various size classes. This indicates that the price of eggs is not a primary concern to the average consumer. A wide range in prices was found within each size class with considerable overlapping between various size classes. A high price did not necessarily mean a larger size, nor was it necessarily an indicator of higher quality. A method which could be used to eliminate misunderstanding is that of reducing prices to a common denominator such as the pound and showing the price per pound as well as per package.<sup>2</sup>

Gabriel (1939) found that 9 percent of the respondents questioned expressed a preference for buying eggs by weight.<sup>3</sup>

Jasper and Cray (1950) found that only 1.3 percent of the housewives

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<sup>1</sup>Associate Agricultural Economist, Louisiana Agricultural Experiment Station, Baton Rouge, La.

<sup>2</sup>F. R. Taylor, A. L. Owens, and A. W. Jasper, *Consumer Egg Quality, Size and Price Relationships*, Rhode Island Agricultural Experiment Station Bulletin 322, Kingston, R. I., February 1955, p. 7.

<sup>3</sup>Harry S. Gabriel, *Marketing of Eggs in Wilmington, Delaware*, Delaware Agricultural Experiment Station Bulletin 597, Newark, Del., 1939.



questioned expressed a preference for purchasing eggs by weight. Those favoring buying eggs by the pound had either been familiar with such a practice in another locality or had given the question some thought.<sup>4</sup>

Taylor, Owens, and Jasper (1952) reported that 22 percent of the housewives interviewed in Providence, Rhode Island, expressed a desire to buy eggs by the pound.<sup>5</sup>

McNiece reported that selling eggs by the pound would help poultry economists and poultry integrators devise a more efficient contract payment to growers. A dozen eggs does not provide a homogeneous contractual standard, because of egg size variation. A standard based on feed eaten divided by pounds of eggs produced would, however, be consistent. At present, a feed conversion ratio of 4.0 (pounds of feed per dozen eggs), in reality, means 2.67 pounds of feed per pound of egg.<sup>6</sup>

Several trade journals have indicated the possibilities of pricing eggs by the pound:

The idea of selling and buying eggs on a weight basis, rather than by the dozen, has numerous advocates. It is based on the assumption that if consumers generally considered the protein value of eggs, in relationship to meat, for example, they would be more inclined to see how favorably eggs rank as a good buy. The hope of egg producers is that this would stimulate greater use of eggs. It is pointed out in trade circles that at today's prices, eggs on a weight basis outrank even cheap hamburger meat as a good food buy.

One Texas egg producer has price schedules on his eggs which tell the housewife the approximate weight of the eggs she is buying. For example, even if a dozen large eggs (weighing about one-and-a half pounds) costs 60 cents, the price per pound of food is only about 40 cents.

The producer urges consumers to compare this cost per pound with the cost of other high protein foods they buy. A pound of egg has about the same food value as a pound of edible meat, and the meat you buy often has a considerable amount of waste bone and excess fat.<sup>7</sup>

A Minnesota hatcheryman claims that these advantages would result if eggs were sold by the pound:

1. The housewife would have a much better chance to compare values in regard to her protein needs. For instance, when beef sells for 79c a lb., pork for 69c a lb., and eggs for only 59c a lb., she has some basis on which to compare prices and values and will buy more eggs.

2. Another place where selling eggs by the pound (or weight)

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<sup>4</sup>A. W. Jasper and R. E. Cray, *Consumer Preference for Eggs in Columbus, Ohio*, Ohio Agricultural Experiment Station Bul. 736, Wooster, Ohio, 1953.

<sup>5</sup>F. R. Taylor, A. L. Owens, and A. W. Jasper, *Preference Patterns for Eggs, Providence, Rhode Island*, Rhode Island Agricultural Experiment Station Bul. 321, Kingston, R. I., 1953.

<sup>6</sup>Dewey McNiece, *Economic Integration in Producing Table Eggs*, Unpublished Ph.D. Dissertation, L.S.U. Graduate School, Baton Rouge, La., 1961.

<sup>7</sup>*St. Louis Livestock Producer*, St. Louis, Mo., December, 1958.



would help the egg producer, is where some producer is producing real large eggs and is now selling them by the dozen and is being underpaid, as it costs him more to produce them. There used to be a market for extra large and fancy eggs, but not any more in this part of the country, so our egg packers cannot pay more for such large eggs.

3. Selling eggs by weight would also eliminate the handicap for an egg producer who has two egg buyers in his locality, where one packs a 23 oz. egg and the other packs a 24 oz. egg, but both pay the same price for No. 1 eggs, or some buyer has a real high price on the top grade but pay mostly on mediums.

4. It would cut down the handling cost of egg packers, as the only thing they would really have to check is egg quality.

5. It would most certainly eliminate the extra price differential between medium and large eggs, which has been a headache to the producer who has eggs that are just about a large size, but not quite, just on the borderline.<sup>8</sup>

Two Extension poultrymen from Washington State converted the price per dozen to price per pound for different seasons of the year (Table 1).

**TABLE 1.—Grade AA Price Quotations Connected to Price per Pound, U. S. D. A., 1957-1958**

|              | Price per Dozen |        |        | Price per Pound |        |        |
|--------------|-----------------|--------|--------|-----------------|--------|--------|
|              | Large           | Medium | Small  | Large           | Medium | Small  |
| July 1, 1957 | \$0.50          | \$0.41 | \$0.30 | \$0.34          | \$0.32 | \$0.27 |
| Oct. 1, 1957 | 0.63            | 0.48   | 0.33   | 0.42            | 0.37   | 0.30   |
| Jan. 1, 1958 | 0.65            | 0.57   | 0.48   | 0.44            | 0.44   | 0.43   |
| Apr. 1, 1958 | 0.57            | 0.51   | 0.41   | 0.38            | 0.39   | 0.37   |
| July 1, 1958 | 0.55            | 0.43   | 0.32   | 0.37            | 0.33   | 0.29   |

Source: Grotts and Jenkins, *Washcoegg*, Seattle, Wash., November, 1958.

In the fall when pullet production is just beginning there is a large supply of "small" eggs in relation to the supply of larger eggs. During the winter this difference evens out to reappear again, to a lesser extent, during the summer. Naturally this variation affects price differentials between the sizes.

The data show that during the past year, according to the price per dozen quotations, small eggs were the best buy on a per pound basis (Table 1).

The difference in value was greatest in the fall. By January 1, there was no difference and by July 1 the value per pound between these three sizes had begun to widen again.<sup>9</sup>

## Method of Study

No controlled experiments have been conducted to determine the feasibility of pricing and selling eggs by the pound. In order to obtain

<sup>8</sup>Letter written by Charles Biersma of Winnebago Hatchery, Winnebago, Minn., to the Editor of *Egg Producer*, January, 1959.

<sup>9</sup>R. F. Grotts and W. R. Jenkins, *Washcoegg*, Seattle, Wash., November, 1958.

reliable results on this problem, a Latin square experiment was utilized, consisting of a 3 x 3 design. This design means that three variables are tested for three weeks in three different stores.

The design of the egg pricing experiment (Table 2) was replicated twice. The experiment ran six weekends in three supermarkets. The tests were conducted on Thursday, Friday, and Saturday of each week.

**TABLE 2.—Latin Square Design for Experiment on Egg Pricing Methods, Three Lake Charles Supermarkets, Louisiana, June-July, 1961**

| Weekend             | Eggs Priced: |                          |              |
|---------------------|--------------|--------------------------|--------------|
|                     | by the dozen | ½ by dozen<br>½ by pound | by the pound |
| June 15 - 17        | Store No. 1  | Store No. 2              | Store No. 3  |
| June 22 - 23 - 24   | Store No. 3  | Store No. 1              | Store No. 2  |
| June 29-30 - July 1 | Store No. 2  | Store No. 3              | Store No. 1  |
| July 6 - 7 - 8      | Store No. 3  | Store No. 1              | Store No. 2  |
| July 13 - 14 - 15   | Store No. 2  | Store No. 3              | Store No. 1  |
| July 20 - 21 - 22   | Store No. 1  | Store No. 2              | Store No. 3  |

### Location of Study

The study was conducted in three supermarkets owned by one corporation in the city of Lake Charles, Louisiana. The corporation is a member of the Independent Grocers (I.G.) Co-op of Lake Charles. The three supermarkets were representative of the medium-sized, neighborhood supermarket. Each store had two check-out counters. One supermarket was located in a high-income neighborhood, one in a middle-income area, and one in a low-income area. The president of the corporation selected the stores.

### Conducting the Test

At the beginning of each test period, eggs in dozen cartons were weighed to determine their average net weights. In each test, the large eggs averaged 26 ounces, and medium eggs, 23.

The store manager, set the price on eggs sold by the dozen for both large and medium eggs. The price of eggs sold by the pound was set so that the total returns from a dozen priced in this way would approximately equal returns for the cartons of eggs priced by the dozen. Therefore, price

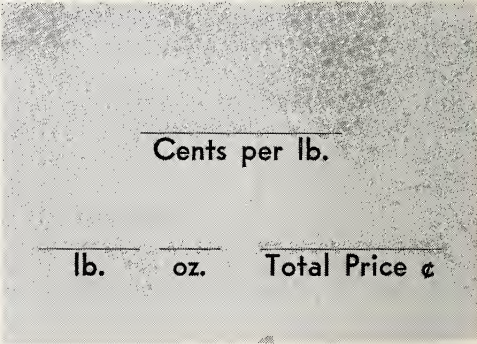


**Figure 1.—Label Used on Cartons of Eggs Sold by the Pound, 1961.**

levels did not enter the experiment. An illustration of the labels used on cartons sold by the pound is shown in Figure 1. From the labels, prospective purchasers could see the price per pound, the weight, and total price of a dozen eggs.

Table 3 shows the “conversion” table used to convert price-by-the-dozen to price-by-the-pound and vice versa.

TABLE 3.—Egg Prices per Dozen Converted to Prices per Pound

| Price per<br>Dozen<br>(Cents) | Mediums         | Large     |
|-------------------------------|-----------------|-----------|
|                               | 23 Ounces       | 25 Ounces |
|                               | Cents per Pound |           |
| 39                            | 27              | 24        |
| 41                            | 28              | 25        |
| 43                            | 30              | 26        |
| 45                            | 31              | 27        |
| 47                            | 33              | 29        |
| 49                            | 34              | 30        |
| 51                            | 35              | 31        |
| 53                            | 37              | 33        |
| 55                            | 38              | 34        |
| 57                            | 39              | 35        |

Source: Egg Price Conversion Tables, U.S.D.A., Washington, D.C.

Medium- and large-egg cartons used to compare eggs sold by the dozen with those sold by the pound are pictured in Figure 2.



Figure 2.—Store Display Showing Cartoned Eggs Sold by the Dozen Versus the Pound.



Prices during the two trials are shown in Table 4. Each store followed about the same price schedule except for an occasional one to two cents per dozen price reduction on eggs that had been on display for some time.

**TABLE 4.—Egg Prices per Dozen and per Pound for the First and Second Trials, Lake Charles Supermarkets Participating in the Experiment, June - July, 1961**

| Trial | Weeks  | Cents per Dozen |                 | Cents per Pound |                 |
|-------|--------|-----------------|-----------------|-----------------|-----------------|
|       |        | Large           | Medium          | Large           | Medium          |
| I     | Week 1 | 57              | 49              | 35              | 35              |
|       | Week 2 | 53              | 39 <sup>a</sup> | 33              | 27 <sup>a</sup> |
|       | Week 3 | 55              | 49              | 34              | 34              |
| II    | Week 4 | 53              | 47              | 33              | 33              |
|       | Week 5 | 57              | 49              | 35              | 35              |
|       | Week 6 | 57              | 49              | 35              | 35              |

<sup>a</sup>Medium eggs were used as a "special" by all three stores.

Eggs were candled at regular intervals to insure Grade A interior quality. Eggs were procured from a local egg producer-packer. Deliveries to food stores were made twice weekly on Monday and Thursday. Whenever one store ran short, eggs were transferred from one of the other stores so that all displays were properly maintained.

Check-out procedures were not altered. Eggs priced by the pound were registered according to the total price indicated on the label.

Egg pricing procedures used by the stores usually consisted of a pre-weekend price and a weekend price. The former applied to Monday, Tuesday, and Wednesday, the latter to Thursday, Friday, and Saturday. In addition, two stores stayed open on Sunday mornings and sometimes a third egg price was applicable for that day. For this experiment, only weekend prices were of interest. A special sale on medium eggs during the second week of the first trial provided the only deviation from the pricing techniques previously described. This deviation was due to a prior agreement by all members of the I.G. Co-op Food Stores to follow price specials announced by the Co-op. Eggs sold in all three stores had the same low prices; therefore, no particular treatment benefited from this price reduction.

## Results of Study

### Effect of Pricing Technique on Egg Sales

Table 5 presents a summary (for each day of the two trials) of the number of customers in the stores, of egg sales in dozens, and of egg sales per 100 customers.

Egg sales averaged 5.94, 6.05, and 5.75 dozens per 100 customers for displays containing only eggs priced by the dozen, an equal number of eggs priced by the dozen and by the pound, and for eggs priced only by the pound, respectively. *These small differences in sales of eggs could be due to chance variation. They were not significant at the 5 percent confidence level* (Appendix Tables 1 and 2).



TABLE 5.—Customer Units, Total Egg Sales, and Sales per 100 Customers, by Day, First and Second Trials, Three Lake Charles Supermarkets, June - July, 1961

| Dates                | Priced by the Dozen |               |                        | Priced by Dozen & Pound |               |                        | Priced All by the Pound |               |                        |
|----------------------|---------------------|---------------|------------------------|-------------------------|---------------|------------------------|-------------------------|---------------|------------------------|
|                      | Cus-<br>tomers      | Dozen<br>Sold | Dozen per<br>100 Cust. | Cus-<br>tomers          | Dozen<br>Sold | Dozen per<br>100 Cust. | Cus-<br>tomers          | Dozen<br>Sold | Dozen per<br>100 Cust. |
| <b>First Trial:</b>  |                     |               |                        |                         |               |                        |                         |               |                        |
| June 15              | 804                 | 32            | 3.98                   | 627                     | 25            | 3.99                   | 587                     | 5             | 0.85                   |
| 16                   | 929                 | 63            | 6.78                   | 682                     | 49            | 7.18                   | 570                     | 29            | 5.09                   |
| 17                   | 1,124               | 72            | 6.41                   | 847                     | 55            | 6.49                   | 517                     | 17            | 3.29                   |
| 22                   | 471                 | 31            | 6.58                   | 800                     | 43            | 5.38                   | 597                     | 45            | 7.54                   |
| 23                   | 508                 | 53            | 10.43                  | 914                     | 71            | 7.77                   | 746                     | 53            | 7.10                   |
| 24                   | 535                 | 36            | 6.73                   | 1,196                   | 136           | 11.37                  | 938                     | 117           | 12.47                  |
| 29                   | 439                 | 36            | 8.20                   | 369                     | 5             | 1.36                   | 661                     | 25            | 3.78                   |
| 30                   | 634                 | 49            | 7.73                   | 396                     | 15            | 3.79                   | 858                     | 45            | 5.24                   |
| July 1               | 839                 | 40            | 4.77                   | 416                     | 16            | 3.85                   | 1,019                   | 60            | 5.72                   |
| Subtotal             | 6,283               | 412           | 6.56                   | 6,247                   | 415           | 6.64                   | 6,523                   | 396           | 6.07                   |
| <b>Second Trial:</b> |                     |               |                        |                         |               |                        |                         |               |                        |
| July 6               | 368                 | 15            | 4.08                   | 749                     | 28            | 3.74                   | 400                     | 24            | 6.00                   |
| 7                    | 408                 | 15            | 3.68                   | 818                     | 55            | 6.72                   | 579                     | 43            | 7.43                   |
| 8                    | 443                 | 20            | 4.51                   | 1,051                   | 73            | 6.95                   | 792                     | 57            | 7.20                   |
| 13                   | 486                 | 20            | 4.12                   | 407                     | 12            | 2.95                   | 722                     | 26            | 3.60                   |
| 14                   | 661                 | 47            | 7.11                   | 466                     | 22            | 4.72                   | 944                     | 52            | 5.51                   |
| 15                   | 824                 | 38            | 4.61                   | 480                     | 25            | 5.21                   | 1,066                   | 54            | 5.07                   |
| 20                   | 693                 | 20            | 2.89                   | 514                     | 26            | 5.06                   | 387                     | 10            | 2.58                   |
| 21                   | 892                 | 61            | 7.17                   | 607                     | 26            | 4.28                   | 380                     | 20            | 5.26                   |
| 22                   | 1,080               | 70            | 6.48                   | 746                     | 49            | 6.57                   | 422                     | 20            | 4.74                   |
| Subtotal             | 5,855               | 309           | 5.28                   | 5,838                   | 316           | 5.41                   | 5,692                   | 306           | 5.38                   |
| Grand<br>Total       | 12,138              | 721           | 5.94                   | 12,085                  | 731           | 6.05                   | 12,215                  | 702           | 5.75                   |

Egg sales were adjusted for number of customers in each store to remove the effects of customer traffic on egg sales. The adjusted sales per 100 customers by treatments were as follows:

| Treatment                     | Dozens Sold per 100 Customers |                |
|-------------------------------|-------------------------------|----------------|
|                               | Unadjusted Value              | Adjusted Value |
| (A) Priced by Dozen           | 5.94                          | 5.94           |
| (B) Priced by Pound           | 5.75                          | 5.71           |
| (C) Priced by Dozen and Pound | 6.05                          | 6.09           |
| Average, All Treatments       | 5.91                          | 5.91           |

An analysis was made of egg sales by the pound versus by the dozen when displayed side-by-side under Treatment C (Table 6). Eggs priced by the dozen accounted for 45 percent of the sales and those priced by the pound, 55 percent. This difference was subjected to a chi-square test (Appendix Table 3). *The differences in percentage of total sales between the two were significant.*

### Sales Differences Among Stores

Store No. 1 had the most customer traffic and egg sales, but ranked second in egg sales per 100 customers (Table 7). This store was located in a low-income neighborhood.

**TABLE 6.—Sales of Eggs Priced by the Dozen and by the Pound, Two Trials, Three Lake Charles Supermarkets, June - July, 1961.**

| Date        | Half-Half Display Sales |                   |            |       |
|-------------|-------------------------|-------------------|------------|-------|
|             | Sales<br>by Dozen       | Sales by<br>Pound | Percentage |       |
|             |                         |                   | Dozen      | Pound |
| June 15     | 9                       | 16                | 36         | 64    |
| 16          | 23                      | 26                | 47         | 53    |
| 17          | 32                      | 23                | 58         | 42    |
| 22          | 21                      | 22                | 49         | 51    |
| 23          | 23                      | 48                | 32         | 68    |
| 24          | 50                      | 86                | 37         | 63    |
| 29          | 2                       | 3                 | 40         | 60    |
| 30          | 11                      | 4                 | 73         | 27    |
| July 1      | 10                      | 6                 | 63         | 37    |
| Subtotal    | 181                     | 234               | 43.6       | 56.4  |
| July 6      | 17                      | 11                | 61         | 39    |
| 7           | 30                      | 25                | 55         | 45    |
| 8           | 35                      | 38                | 48         | 52    |
| 13          | 9                       | 3                 | 75         | 25    |
| 14          | 8                       | 14                | 36         | 64    |
| 15          | 13                      | 12                | 52         | 48    |
| 20          | 14                      | 12                | 54         | 46    |
| 21          | 10                      | 16                | 38         | 62    |
| 22          | 11                      | 38                | 22         | 78    |
| Subtotal    | 147                     | 169               | 47         | 53    |
| Grand Total | 328                     | 403               | 45         | 55    |

Store No. 2 had the second highest egg sales and customer traffic and the highest sales per 100 customers. It was located in a middle-income neighborhood.

Store No. 3 had the fewest customers, lowest egg sales, and lowest sales per 100 customers. It was located in a high-income neighborhood.

TABLE 7.—Customer Traffic and Egg Sales by Stores for the First, Second, and Combined Trials, Three Lake Charles Supermarkets, June-July, 1961

|                 | Store No. 1 |       |                    | Store No. 2 |       |                    | Store No. 3 |       |                    |
|-----------------|-------------|-------|--------------------|-------------|-------|--------------------|-------------|-------|--------------------|
|                 | Customers   | Dozen | Dozen per Customer | Customers   | Dozen | Dozen per Customer | Customers   | Dozen | Dozen per Customer |
| First Trial     | 8,335       | 547   | 6.56               | 6,349       | 469   | 7.39               | 4,369       | 207   | 4.74               |
| Second Trial    | 8,015       | 442   | 5.51               | 5,609       | 330   | 5.88               | 3,761       | 159   | 4.23               |
| Combined Trials | 16,350      | 989   | 6.05               | 11,958      | 799   | 6.68               | 8,130       | 366   | 4.50               |

## Sales Differences Among Weeks

The variation by weeks for customer traffic, egg sales, and sales per 100 customers for combined trials was tabulated. During week 2, customer traffic, total egg sales, and sales per 100 customers were highest in the six weeks of the experiment. This phenomenon was probably due

TABLE 8.—Egg Sales by Size of Egg, Two Trials, Three Lake Charles Supermarkets, June-July, 1961

| Dates       | Sales by Size |                  |       | Percentage |        |
|-------------|---------------|------------------|-------|------------|--------|
|             | Large         | Medium           | Total | Large      | Medium |
| June 15     | 12            | 50               | 62    | 19.4       | 80.6   |
| 16          | 38            | 103              | 141   | 27.0       | 73.0   |
| 17          | 56            | 88               | 144   | 38.9       | 61.1   |
| 22          | 23            | 96 <sup>a</sup>  | 119   | 19.3       | 80.7   |
| 23          | 32            | 145 <sup>a</sup> | 177   | 18.1       | 81.9   |
| 24          | 92            | 197 <sup>a</sup> | 289   | 31.8       | 68.2   |
| 29          | 20            | 46               | 66    | 30.3       | 69.7   |
| 30          | 34            | 75               | 109   | 31.2       | 68.8   |
| July 1      | 55            | 61               | 116   | 47.4       | 52.6   |
| Subtotal    | 362           | 861              | 1,223 | 29.6       | 70.4   |
| July 6      | 21            | 46               | 67    | 31.3       | 68.7   |
| 7           | 25            | 88               | 113   | 22.1       | 77.9   |
| 8           | 35            | 115              | 150   | 23.3       | 76.7   |
| 13          | 18            | 40               | 58    | 31.0       | 69.0   |
| 14          | 34            | 87               | 121   | 28.1       | 71.9   |
| 15          | 36            | 81               | 117   | 30.8       | 69.2   |
| 20          | 20            | 36               | 56    | 35.7       | 64.3   |
| 21          | 44            | 66               | 110   | 40.0       | 60.0   |
| 22          | 50            | 89               | 139   | 36.0       | 64.0   |
| Subtotal    | 283           | 648              | 931   | 30.4       | 69.6   |
| Grand Total | 645           | 1,509            | 2,154 | 29.9       | 70.1   |

<sup>a</sup>Special sale on medium eggs.

to the "special" sale conducted on medium eggs and "price specials" on a number of other basic food items.

An analysis for days of the week showed that Thursday accounted for 20 percent of egg sales; Friday, 36 percent; and Saturday, 44 percent. Egg sales per 100 customers were also highest for Saturday and lowest on Thursday.

## Sales Differences Between Sizes of Eggs

Table 8 shows a tabular analysis of total egg sales by size of egg. Medium eggs accounted for 70.1 percent of sales, and large eggs, 29.9 percent. No small eggs were sold.

The main reasons for medium eggs outselling large eggs were: (1) large eggs were priced higher per dozen, and (2) medium eggs weighing 23 ounces per dozen probably gave consumers eggs of adequate size, in most cases.

## Conclusions

The conventional marketing system for eggs sold through food stores is from *grower to egg dealer-packer to retail store to consumer*.

The study showed that, when all three treatments (A, B, and C)<sup>10</sup> were analyzed together, consumers were apparently just as satisfied to purchase by the pound as by the dozen. A separate analysis was made of the treatment in which eggs were sold by the pound and by the dozen, side-by-side. In this treatment consumers actually purchased 55 percent by the pound and 45 percent by the dozen. Statistical analysis of this data indicated this difference in purchases was not due to chance but was "statistically significant."

This strengthens the earlier conclusion that consumers are at least indifferent to pricing eggs by the pound, and even suggests a possible preference for this method of pricing.

## Appraisal

If the new pricing technique were to be used, the *food store* and the *egg packer* would be most involved.

Under present conditions, the *food store* may hesitate to change its pricing method, primarily because of the extra cost in pricing eggs by the pound. The extra labor involved in pricing eggs by the pound in retail stores, as compared with conventional pricing, consists of *labeling and weighing each individual carton and consulting "conversion" charts* for proper pricing. All other steps in displaying and merchandising the eggs are about the same.

A limited time and motion study was conducted during the experiment to ascertain the extent of this extra cost in pricing eggs by the pound. It would amount to about 1.7 cents per dozen if all store labor

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<sup>10</sup>Treatment A, eggs sold by the dozen; Treatment B, by the pound; Treatment C, by the dozen and by the pound.



is fully employed and new employees were hired at \$1.00 per hour. If store labor is available and otherwise not busy, the extra cost would be nil.

Under existing conditions, if a store or supermarket operator desires to sell eggs by the pound, one recommendation would be to shift the egg pricing operation to the "produce weigher" in the supermarket.

Another possibility for storekeepers is to sell eggs loose in a rubber-coated wire basket displayed alongside the cartoned eggs. The loose eggs could be sold by the pound when a customer wants less than one dozen. Regular paper bags could be used for such purchases, with EGGS - FRAGILE marked on the paper bags.

However, the food store is limited in selling eggs by the pound unless the *egg packer* adapts to this system. The egg packer could facilitate pricing by the pound, by marking the net weight on each carton at the plant. This might involve extra costs for the packer in handling and equipment for which he may or may not be compensated.

If eggs could be bought and sold by the pound, marketing margins could be set on a per-pound basis.

The discussion so far refers to one store and one packer selling eggs by the pound in a marketing system that sells eggs by the dozen. If substantial numbers in the egg market converted to a per-pound basis, it is conceivable that some economies could arise; for instance, it would be easier to weigh a carton of eggs than size individual eggs for a carton.

*(See Pages 14 and 15 for Appendix Tables)*

## Appendix Tables

**TABLE 1.—Analysis of Variance for Customer Units (x), Combined Trials, Three Lake Charles Supermarkets, Louisiana, 1961**

| Source of Variance                                                   | D.O.F.    | Sums of Squares | Mean Square |
|----------------------------------------------------------------------|-----------|-----------------|-------------|
| Trials                                                               | 1         | 154,568         | 154,568     |
| Weeks Within Trials                                                  | 4         | 274,293         | 68,573      |
| Weeks                                                                | 2         | 164,020         | 82,010      |
| Weeks x Trials                                                       | 2         | 110,273         | 55,136.5    |
| Stores Within Trials                                                 | 4         | 5,654,912       | 1,413,728   |
| Stores                                                               | 2         | 5,639,536       | 2,819,768   |
| Stores x Trials                                                      | 2         | 15,376          | 7,688       |
| Treatments Within Trials                                             | 4         | 20,361          | 5,090.25    |
| Treatments                                                           | 2         | 1,424.3         | 712.15      |
| Treatments x Trials                                                  | 2         | 18,936.7        | 9,468.35    |
| Errors Within Trials                                                 | 4         | 11,890          | 5,945       |
|                                                                      | 82,010    |                 |             |
| Weeks: F (Variance Ratio) = $\frac{82,010}{5,945} = 13.79^*$         |           |                 |             |
| (2,4)                                                                | 5,945     |                 |             |
|                                                                      | 2,819,768 |                 |             |
| Stores: F (Variance Ratio) = $\frac{2,819,768}{5,945} = 474.30^{**}$ |           |                 |             |
| (2,4)                                                                | 5,945     |                 |             |
|                                                                      | 712.15    |                 |             |
| Treatments: F (Variance Ratio) = $\frac{712.15}{5,945} = .12$        |           |                 |             |
| (2,4)                                                                | 5,945     |                 |             |
| *5% level = 6.94                                                     |           |                 |             |
| **1% level = 18.00                                                   |           |                 |             |

**TABLE 2.—Analysis of Variance for Egg Sales (y), Combined Trials, 1961**

| Source of Variance                                                 | D.O.F.    | Sums of Squares | Mean Squares |
|--------------------------------------------------------------------|-----------|-----------------|--------------|
| Trials                                                             | 1         | 4,737.0         | 4,737.00     |
| Weeks Within Trials                                                | 4         | 16,453.0        | 4,113.25     |
| Weeks                                                              | 2         | 7,189.0         | 3,594.50     |
| Weeks x Trials                                                     | 2         | 9,264.0         | 4,632.00     |
| Stores Within Trials                                               | 4         | 34,689.0        | 8,672.25     |
| Stores                                                             | 2         | 33,984.3        | 16,992.15    |
| Stores x Trials                                                    | 2         | 704.7           | 352.25       |
| Treatments Within Trials                                           | 4         | 87.0            | 43.50        |
| Treatments                                                         | 2         | 72.3            | 36.15        |
| Treatments x Trials                                                | 2         | 14.7            | 7.35         |
| Errors Within Trials                                               | 4         | 908.0           | 227.00       |
|                                                                    | 3,594.5   |                 |              |
| Weeks: F (Variance Ratio) = $\frac{3,594.5}{227} = 15.83^*$        |           |                 |              |
| (2,4)                                                              | 227       |                 |              |
|                                                                    | 16,992.15 |                 |              |
| Stores: F (Variance Ratio) = $\frac{16,992.15}{227} = 748.55^{**}$ |           |                 |              |
| (2,4)                                                              | 227       |                 |              |
|                                                                    | 36.15     |                 |              |
| Treatments: F (Variance Ratio) = $\frac{36.15}{227} = .16$         |           |                 |              |
| (2,4)                                                              | 227       |                 |              |
| *5% level = 6.94                                                   |           |                 |              |
| **1% level = 18.00                                                 |           |                 |              |

TABLE 3.—Chi-Square Analysis, Sales by the Pound vs. Sales by the Dozen, Combined Trials

| Item                                                                                                                               | D.O.F. | Chi-Square Value               |
|------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------|
| <b>First Trial</b>                                                                                                                 |        |                                |
| Week 1                                                                                                                             | 1      | 15.380                         |
| Week 2                                                                                                                             | 1      | .008                           |
| Week 3                                                                                                                             | 1      | 2.778                          |
| <b>Second Trial</b>                                                                                                                |        |                                |
| Week 1                                                                                                                             | 1      | .410                           |
| Week 2                                                                                                                             | 1      | .017                           |
| Week 3                                                                                                                             | 1      | 9.515                          |
| Pooled $X^2$                                                                                                                       | 6      | 28.108                         |
| Total                                                                                                                              | 1      | 7.695*                         |
| Difference<br>(Heterogeneity)                                                                                                      | 5      | 20.413*                        |
|                                                                                                                                    |        | Significant at<br>the 1% level |
| $X^2 = \frac{2(328.0 - 365.5)^2}{365.5} = \frac{2(-37.5)^2}{365.5} =$ $\frac{2(1406.25)}{365.5} = \frac{2812.50}{365.5} = 7.695^*$ |        |                                |





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# Hotbeds for Sweet Potato Plant Production in Louisiana

Wiley D. Poole



Bulletin No. 556

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Louisiana State University  
and  
Agricultural and Mechanical College  
Agricultural Experiment Station  
Charles W. Upp, Director

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# Hotbeds for Sweet Potato Plant Production in Louisiana

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Farmers are aware of the importance of setting out sweet potato plants just as soon as possible after the danger of a late frost has passed. Having early plants available for field setting has many times resulted in additional cash returns to the farmer, because he was thus able to harvest early and take advantage of a higher price paid for early potatoes. In general, early planting has enabled the farmer to enjoy a longer growing season and to complete harvesting before the rainy season in the fall.

Except in the most southern part of the sweet potato area of Louisiana, it is advisable to utilize some type of hotbed for producing sweet potato plants large enough for field setting immediately after the danger of late frosts. In this bulletin consideration will be given to the most suitable location and types of hotbeds, as well as the means for heating them under Louisiana's climatic conditions.

## Location of the Hotbed

Hotbeds should always be located on a well-drained site that is free from low spots and which will not flood during heavy rains. A location near the house where the beds can be given frequent attention is desirable. The artificial heat supplied to the hotbed is a supplement to the heat supplied by the sun; therefore, the hotbed should be located so as to be exposed to the sun as much as possible and also protected from the north wind. In locating the hotbed consideration should be given to the convenience of piping water to the bed, and also gas or electricity, whichever is to be used as a source of heat. If the location is on a slight slope, a drainage ditch should be dug on the uphill side to prevent rain water from entering the bed.

## Size of Hotbed

Figure 1 shows three typical sizes of hotbeds which are laid out to use most economically the standard lengths of electric heating cable kits. Some of the larger commercial plant growers prefer the wider hotbed shown in Figure 4. The size and number of hotbeds needed by a farmer will depend on the acreage to be planted as well as the method to be used for planting this acreage. A small acreage might well be planted with slips from the hotbed, or a larger acreage may be planted from vine cuttings taken from early hotbed slips which were planted in the field. In determining the size of hotbed needed it should be remembered that approximately 12,500 plants are needed to set one

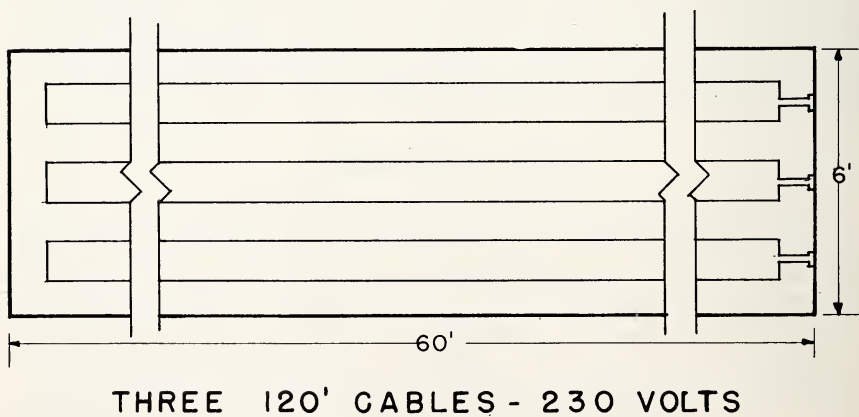
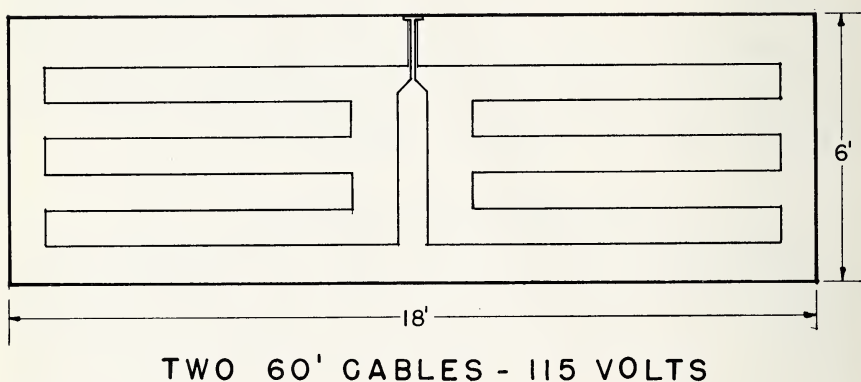
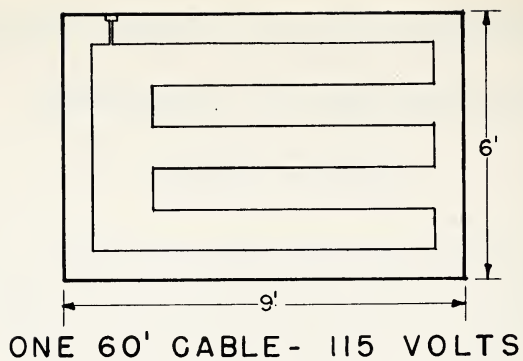


FIGURE 1.—Typical sizes of electrically heated hotbeds using electric heating cable.



acre of sweet potatoes on rows  $3\frac{1}{2}$  feet apart when the plants are spaced about 12 inches apart in the row.

Table 1 gives the number of plants needed to plant one acre for various row widths when plants are spaced 8, 12, 18 or 24 inches.

**TABLE 1.—Number of Plants Required for Setting Out an Acre for Various Row Widths and Various Plant Spacings on the Row**

| Row spacing | Spacing of plants on the row |           |           |           |
|-------------|------------------------------|-----------|-----------|-----------|
|             | 8 inches                     | 12 inches | 18 inches | 24 inches |
| 36 inches   | 21,800                       | 14,520    | 9,680     | 7,260     |
| 42 inches   | 18,700                       | 12,444    | 8,296     | 6,222     |
| 48 inches   | 16,350                       | 10,890    | 7,260     | 5,445     |
| 54 inches   | 14,666                       | 9,680     | 6,453     | 4,840     |
| 60 inches   | 13,200                       | 8,712     | 5,808     | 4,356     |

Results of various investigations indicate that, for hotbed setting, small roots will produce more plants than the larger roots. Edmond and Dunkelberg (1) found that crowding the roots in the hotbed increased substantially the number of plants per unit of area. This also appreciably reduced the labor and heat requirements per given number of plants. Therefore, to get the most out of the hotbed space, it is recommended that as many roots as possible be placed in the bed so long as they do not touch one another. Not allowing the roots to touch is a precaution to prevent rotting; however, research data indicates that touching of roots in the hotbed will not increase rotting if the seed stock is healthy and free from disease to start with.

A bushel of U. S. No. 1 seed sweet potatoes will generally produce in a hotbed 2,000 to 2,500 plants from a total of three or four pullings. A bushel of U. S. No. 1 seed potatoes will occupy about 15 square feet of hotbed space.

## Materials and Methods for Constructing the Hotbed

### The Frame

A well-constructed hotbed frame should be free of cracks which might let the heat escape. The cover should fit snugly to the frame on all sides. A suitable frame can be built of lumber 1 inch thick with the main supporting members made of 2-inch by 4-inch battens and stakes. If the bed is to be used for several seasons, then the lumber should be of a type such as cypress or cedar or treated lumber which will withstand the weather. Figure 2 shows a cross section of a typical hotbed 6 feet wide with sides made of lumber. This type of hotbed is designed to use either glass sash or cloth as a cover. The suggested lengths for this type of hotbed when electric cable is used for heating are shown in Figure 1.

For a more permanent installation the sides and ends of the hotbed can be made of brick, concrete block or similar long-lasting materials. There are a number of hotbeds of this type in Louisiana

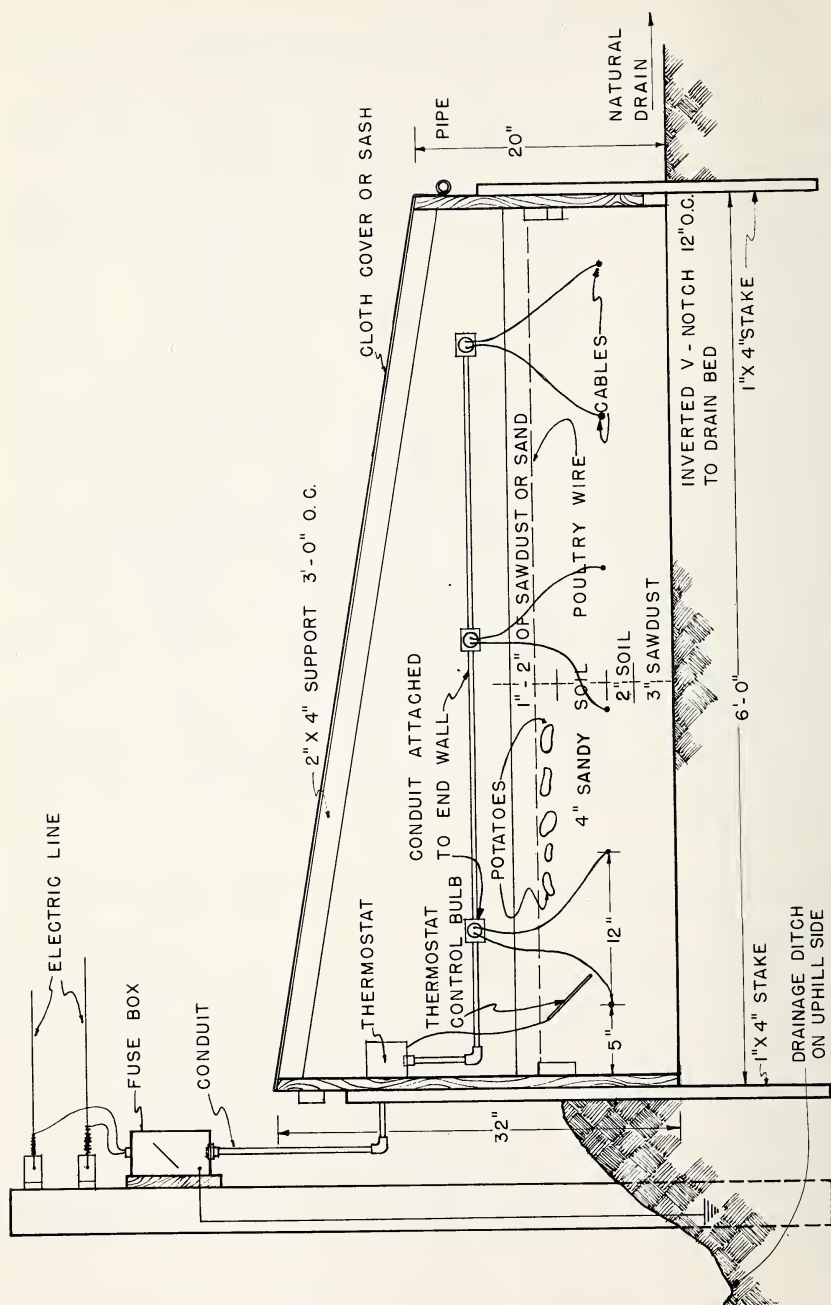


FIGURE 2.—Cross section view of a typical sash or cloth covered, electrically heated hotbed.

operated by large commercial plant growers. These beds are usually 10 feet wide and have a gable type of cover framing as shown in Figure 4.

The length of these hotbeds is usually 60 to 100 feet when hot water is used for heating and either 30 or 60 feet when electric heating cable is used.

It is not necessary to excavate below the ground surface in building the artificially heated hotbeds.

## The Cover

The material for covering the hotbed should be given careful consideration because it will greatly affect the over-all cost of operating the beds over several seasons. Some materials, if carefully handled, will last many seasons while others will be so affected by weather that only one or two seasons is all that can be expected from them. Glass sash cover probably has been used the longest and will last longer than any other type of cover. It is also the most expensive to use because of the cost of the frames and glass. For this reason it has lost popularity for large installations.

Recent introduction of polyethylene film has offered a new type of translucent cover for hotbeds. It can be obtained in widths that will fit any commercial bed and in 100-foot rolls. This material can also be obtained as a black film which seems to stand the weather better than the translucent but must be rolled back off the bed to allow sunlight to the plants. Film thickness should be at least 4 mils. If polyethylene is used as a cover, careful attention must be given to properly ventilate the beds by removing the cover when the sun shines,



**FIGURE 3.**—Sweet potato hotbeds with covers made of lightweight wood sash frames covered with heavy 5-mil clear plastic.

**FIGURE 4.—Typical gable type wide hotbed used by commercial growers.**



to prevent very high temperature from building up under the cover, which would injure the plants. The film must be protected from sharp points, corners, or nails, as it will rupture easily. It must also be stretched tight over the supporting frames to avoid flapping or sagging. Figure 3 shows hotbeds with covers made of lightweight wood frames covered with 5-mil clear plastic.

Heavy cloth such as muslin has been used extensively as a hotbed cover on large installations. Experiments comparing glass sash and cloth cover, conducted by engineers of the Louisiana Agricultural Experiment Station, showed that under Louisiana conditions the cloth cover produced plants at a slightly lower consumption of heat, but the glass sash produced plants slightly earlier than the cloth covered hotbeds. Cloth covered hotbeds do not have as great a change in temperature due to sunshine as the plastic covered hotbeds. Cloth covers are fastened to the hotbeds and can be rolled up the same as the plastic film covers as shown in Figures 2 and 4. One side of the cover should be attached to a roll as this makes the job of rolling the cover back for ventilation easy. This roll should be wired to the hotbed frame to prevent air currents from getting under the cover and tearing it. Figure 5 shows large hotbeds using muslin as a cover. Notice that there is no sag in the cloth cover over the hotbed.



**FIGURE 5.**—Large commercial hotbeds using muslin cloth as a cover.

## **Insulation**

Because of the reasonably mild weather during the period of operating the sweet potato hotbeds, the use of commercial insulation in these hotbeds is not recommended. However, the use of insulating materials that are obtainable around the farm at no additional cost, such as pine straw, sawdust, chopped corn cobs or chopped hay, is recommended. Ordinarily, heat loss through the soil under the hotbed

is small as compared to the losses through the sash and frame. Research studies were conducted to determine to what extent the heat consumption of a hotbed could be reduced by utilizing from 3 to 4 inches of farm waste material such as pine straw, chopped hay or cornstalks, or wood shavings under the heating cables or pipes in the hotbed. Results of these experiments showed that an average saving in heat consumption as great as 15 to 20 per cent could be expected from use of such insulation. This insulating layer is shown in the cross section drawing of a hotbed in Figures 2 and 4.

It is also recommended that farm waste insulating material as mentioned in the above paragraph be piled around the outside ends and sides of the hotbed to give further protection from the cold air. All cracks in the hotbed should be sealed to prevent leakage.

## Bedding Media

A sandy loam type of soil has been used more extensively than any other material for bedding sweet potatoes in hotbeds. Sand and sawdust are sometimes used, but if no additional plant food is to be added to the bedding media, it is recommended that a sandy loam soil be used. Edmond and Dunkelberg (2), when comparing soil and sand as a bedding media, found little difference, if any, in total plants produced when equal amounts of commercial fertilizer were added. However, a great deal of difference in favor of soil existed when soil alone and sand alone were compared. It would seem then that the most influential factor in the bedding media for producing plants is the plant food present. Therefore, it is recommended that commercial fertilizer be added to and thoroughly mixed with the bedding media to increase plant production of the hotbed. The rate of fertilizer application should be approximately 300 to 350 pounds per acre of the type recommended for the area.

If a fine loam soil is used as a bedding media there is danger of a crust forming from frequent watering. To prevent this it is recommended that a layer of 1 to 2 inches of sawdust or sand be placed on top of the bedding soil. To prevent moving or disturbing the mother potato when pulling slips, a layer of poultry wire should be placed over the entire bed after the sweet potatoes are placed in the hotbed. The location of the poultry wire, sawdust, etc., is shown in the cross section view of a standard hotbed in Figures 2 and 4.

## Methods of Heating Hotbeds

Many research workers have conducted experiments to determine the optimum temperature to hold the sweet potato hotbeds for the most economical plant production. It is generally considered that the temperature of the potato should be between 80° F. and 85° F. Edmond and Dunkelberg (2) narrowed this range down to 83° F. to 85° F. The more closely the optimum temperature is maintained within a sweet potato hotbed, the greater will be the efficiency of plant production.

In south Louisiana it is a common practice to depend upon field setting for plants. However, adverse weather conditions such as cold rains or a late cold spell render this practice very uncertain for the very early slips. Table 2 gives the average minimum temperature for the various sweet potato areas of Louisiana during the three months in which sweet potato plants are being grown for field setting. It is obvious that these probable low temperatures are far below the recommended temperature for favorable plant growth.

In several southern areas of the state hotbeds are sometimes used without any source of heat other than the sun's rays during the day. The frame and cover for such hotbeds are the same as those for the heated type. During cold spells or cool nights the hotbed frame and cover offer some protection and tend to hold the heat accumulated during the day.

Another practice used to speed up plant production is to cover the top of the seedbed in the field with polyethylene film as previously described under "Hotbed Covers." This plastic film allows the soil to absorb much of the sun's rays during the day. Heat thus absorbed is transmitted to the seed potato in the row. The plastic film will also protect the row from cold winds and tend to hold the heat in the row.

**TABLE 2.—Average Minimum Temperature in Degrees Fahrenheit for the Sweet Potato Areas of Louisiana**

| Area             | Length of<br>record (years) | March | April | May  |
|------------------|-----------------------------|-------|-------|------|
| Shreveport       | 56                          | 48.8  | 56.3  | 63.6 |
| Alexandria       | 36                          | 49.3  | 55.5  | 62.6 |
| Monroe           | 43                          | 47.1  | 54.5  | 62.0 |
| Baton Rouge      | 43                          | 51.7  | 58.0  | 64.1 |
| St. Francisville | 19                          | 49.5  | 55.3  | 62.4 |
| Opelousas        | 26                          | 50.1  | 55.8  | 62.6 |
| Lafayette        | 38                          | 51.2  | 57.1  | 63.3 |

Probably the oldest method of supplying heat to hotbeds is the use of fermenting horse or mule manure. Because of the scarcity of the manure, the danger of spreading sweet potato diseases, and the larger amount of labor required for setting up this type of hotbed, its use has rapidly declined. Also, there is no way to control the heat in this type of hotbed. This method is no longer recommended.

Another method that was used extensively when labor was more plentiful was flue heating. Hot flue gases were used in several ways to heat the hotbeds. Usually one or two ditches were dug in the bottom of the hotbed and covered with some type of metal. Soil was then placed over the metal covering and the sweet potatoes bedded in the soil. At the end of the bed was a fire box of some type where a wood or gas fire furnished the hot flue gas. This type of hotbed required much labor and attention at all times during the growing season. There was danger of overheating or underheating the beds when using inexperienced labor for firing the fire box. Thus when

other methods of heating the hotbeds were developed which could be automatically controlled, this flue-heat method was quickly discontinued.

## Electrically Heated Hotbed

A special flexible, electric soil-heating cable has become a popular means of heating hotbeds in Louisiana. Popularity of the soil-heating cable can be attributed to several factors. One is that recently electricity has been made available to practically all farmers. Electrically heated hotbeds are thermostatically controlled and therefore require very little tending; at the same time, the hotbed maintains a very constant heat even with fluctuating outside temperatures. They require less labor to construct, and no fuel has to be hauled and no firing done. This is probably the best method of heating for the farmer who wants to put in one 6 by 9 or 6 by 18-foot bed as shown in Figure 1.

The lead-covered soil-heating cable consists of a high resistance conductor covered with felted asbestos, varnished cambric, and a protective lead sheath. Because of its electrical resistance it must always be used in a 60-foot length on a 115-volt circuit or a 120-foot length on a 230-volt circuit. The 60-foot length is rated at 400 watts and the 120-foot length at 800 watts.

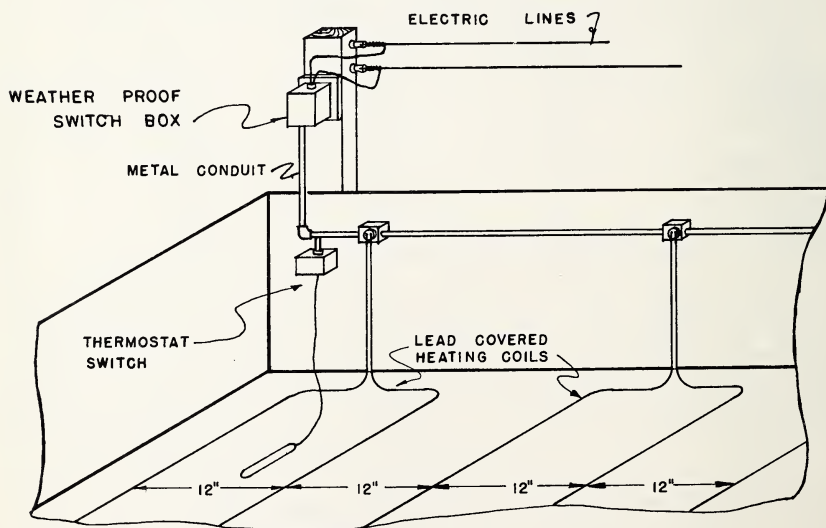


FIGURE 6.—Wiring diagram for electric cable heated hotbed.

Results of tests under Louisiana conditions show that about 7 watts per square foot is all the heat necessary for growing sweet potato plants in a hotbed. On the basis of this figure for heat requirement and the standard lengths of electric cable (60 feet for 115 volts and 120 feet for 230 volts), three sizes and placement of electric heating cable for each size are shown in Figure 1.



Some companies now offer soil heating kits which consist of one soil thermostat with plug receptacle attached and one or two 60-foot lengths of heating cable. The heating cable in this case will have a heavy-duty male plug on the end for plugging into the receptacle. Figure 6 shows the standard kit unit plus a switch box.

For large installations where large quantities of the heating cable are to be used, it is more economical to buy the heating cable in bulk quantity in multiples of 60 or 120 feet. The bed can then be wired by the farmer or an electrician in a manner shown in Figures 6 and 7. The proper size wire for conveying electricity to the beds can be obtained from Table 3.

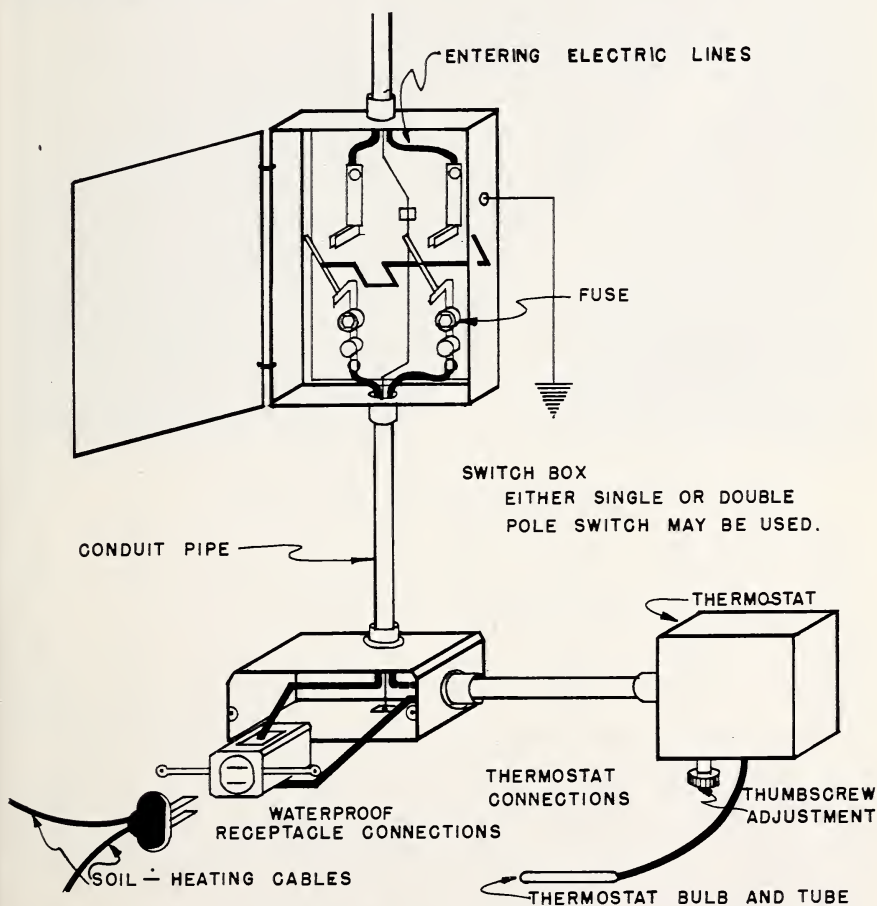


**FIGURE 7.**—Installation of the thermostat, switches, and receptacles in an electric cable heated hotbed.

Several manufacturing companies have recently developed a heating cable covered by a plastic sheath in place of the lead sheath. These cables are much lighter than the lead-covered cables and are easy to

handle. The heating value per foot of this cable is usually slightly less than that of the lead-covered cable; therefore more is used for the same size hotbed. The wattage of these plastic cables is always given in the literature on the cable. Make sure that at least 7 watts per square foot of hotbed is used.

The general construction of the hotbed frame and selection of a suitable site for the hotbed are the same as covered in previous paragraphs under these topics.

It is known that the roots produce the maximum number of plants when held between 83° F. and 85° F. Therefore, in order to maintain an even temperature at the level of the roots in a hotbed, the heating cable should be placed at a definite depth below the roots for a given spacing. Studies on this subject were conducted under controlled conditions in the laboratory. Results of the tests indicate that a uniform temperature in the hotbed at the level of the bedded roots can be obtained if the depth of the lead-covered cable below the roots is as follows: For a cable spacing of 10 inches, distance of cable under roots should be 3 inches; for a cable spacing of 12 inches, distance of cable under roots should be 4 inches; for a cable spacing of 14 inches, distance of cable under roots should be 5 inches.

**TABLE 3.—Wire Size to Use in Running 115- and 230-Volt Extensions, Varying in 100-Foot Lengths, from Metering Point to Hotbeds of Sizes Shown. (These are the Size Wires Required to Keep the Voltage Drop Below the Maximum Allowed for Economical Operations.)**

| Length of<br>Soil Cable<br>in Feet | Distance (Feet) |           |          |         |       |     |       |
|------------------------------------|-----------------|-----------|----------|---------|-------|-----|-------|
|                                    | 100             | 200       | 300      | 400     | 500   | 750 | 1,000 |
|                                    |                 | Wire Size | Required | for 115 | Volts |     |       |
| 60                                 | 10*             | 10*       | 10*      | 10      | 10    | 8   | 8     |
| 120                                | 10*             | 10*       | 10       | 10      | 8     | 6   | 4     |
| 180                                | 10*             | 10*       | 8        | 8       | 6     | 4   | 4     |
|                                    |                 | Wire Size | Required | for 230 | Volts |     |       |
| 240                                | 10*             | 10*       | 10*      | 10      | 8     | 8   | 6     |
| 360                                | 10*             | 10*       | 10       | 8       | 8     | 6   | 6     |
| 480                                | 10*             | 10*       | 10       | 8       | 8     | 6   | 4     |
| 600                                | 10              | 10        | 8        | 8       | 6     | 4   | 4     |

\*Minimum size allowed by National Safety Code for outside overhead conductors.

Figures 2 and 4 show cross section views of a standard 6-foot and a 10-foot hotbed. These figures show the recommended insulating layer between the cable and the ground, the spacing of the heating cable, and distance above the cable for bedding the roots. The sawdust or sand layer above the roots prevents a crust from forming and makes pulling slips much easier. The poultry wire above the roots is to prevent disturbing the roots when pulling slips.

If the hotbeds are to remain in the same location each year, then the bedding soil down to the heating cable should be removed and replaced with fresh soil at the time of bedding the roots in the

spring. In removing this soil it is very easy to cut or damage the heating cable, causing faulty operation. To avoid damaging the cable many operators have covered it with half-inch mesh hardware cloth. Damage from cable cutting can be very expensive. The heating cable and hardware cloth are shown in Figure 8.



**FIGURE 8.**—Electrically heated hotbed showing electric heating cables in place and hardware cloth to be placed over the cables.

The thermostat plays a very important part in the hotbed operation. It is the instrument that keeps the hotbed at the proper temperature. If its operation is faulty, serious damage might result to the roots in the hotbed. It is recommended that the thermostat be tested each spring before the hotbed is put into operation. The method used for properly adjusting the thermostat is discussed in a later paragraph under "Operating the Hotbed."

Results of tests on the operation of electrically heated hotbeds indicate that, for average conditions, electric heat is supplied to a hotbed for a period of 10 to 14 hours each day. As would be expected, this heat is supplied during the night and practically all day on cloudy days. Data taken on the electricity used on a number of hotbeds for the past several seasons show that the average consumption of electricity for the period of operation is from 4.5 to 6.5 kwh per square foot of hotbed surface. The period of operation is usually 6 to 7 weeks.

Electric light bulbs have been used as a source of heat for hotbeds, particularly for small installations. If properly installed this system is usually higher in cost than the electric cable and has all the disadvantages of breakage and danger of shortages due to dampness and



water when watering the beds. This method is not recommended as a farm installation.

## Hot-Water-Heated Hotbed

The use of hot water circulated in pipes buried in the soil of the hotbed has been gaining in popularity among large-scale commercial operators. The frame of the hotbeds using this method of heating is usually the wide gable cover type as shown for the electric bed in Figure 4. The building of the frame and placement of soil, etc. are the same for the hot-water system as has been described for the electric heating cable system. The only difference is that heating pipes are placed where the electric cables are shown in Figures 2 and 4. The hot-water beds are usually 60 feet long, and another bed is set behind the first so that the hot-water pipes can run the full length of the two beds before returning. Figure 9 is a schematic diagram showing all the components that must be used to make a hot-water-heated system.

The principle of operation in the hot-water system is briefly as follows: Water is taken from the open surge tank by the electrically driven centrifugal pump and forced under pressure through the heating coils where it is heated; it is then forced into the hot-water header line, which is a large line that runs at the head of each row of hotbeds; from this header line heated water is forced through pipes that run the length of two beds and return to the head of the beds where they empty into a cold-water header line; the water is returned to the open water surge tank to be pumped again through the system. The duration of operation is controlled by a thermostat just as in the electrically heated system. However, in this case the thermostat makes an electrical connection when the beds become cool, which allows the electric motor to start pumping and at the same time opens a magnetic valve that starts the gas burner under the water coils. When the beds are warm enough, according to the setting of the thermostat, the electrical connection is broken, thereby stopping the electric pump and shutting off the gas burner.

The pipes used in the hotbed can be either  $\frac{1}{2}$ -inch or  $\frac{3}{4}$ -inch regular screw thread or copper pipe and are spaced 12 inches apart as shown in Figure 9. The header lines running at the head of the beds are  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -inch pipe. If the hot-water lines in the hotbeds are longer than 100 feet in one direction, then the  $\frac{3}{4}$ -inch pipe is recommended. This will keep the pressure on the pump at a low figure and allow the use of a smaller pump and motor.

The amount of heat supplied the hot-water beds is the same as for the electrically heated beds but is quoted on a BTU basis, which is a standard measurement for heat when dealing with fluids. For the electric beds, 7 watts of electric heat per square foot is the basis for arriving at the required heat. Since 1 watt is equal to 3.412 BTU, the heat load for the hot-water bed will be  $7 \times 3.412$ , or 23.884 BTU per square foot of bed. (For the purpose of calculating heat load, use



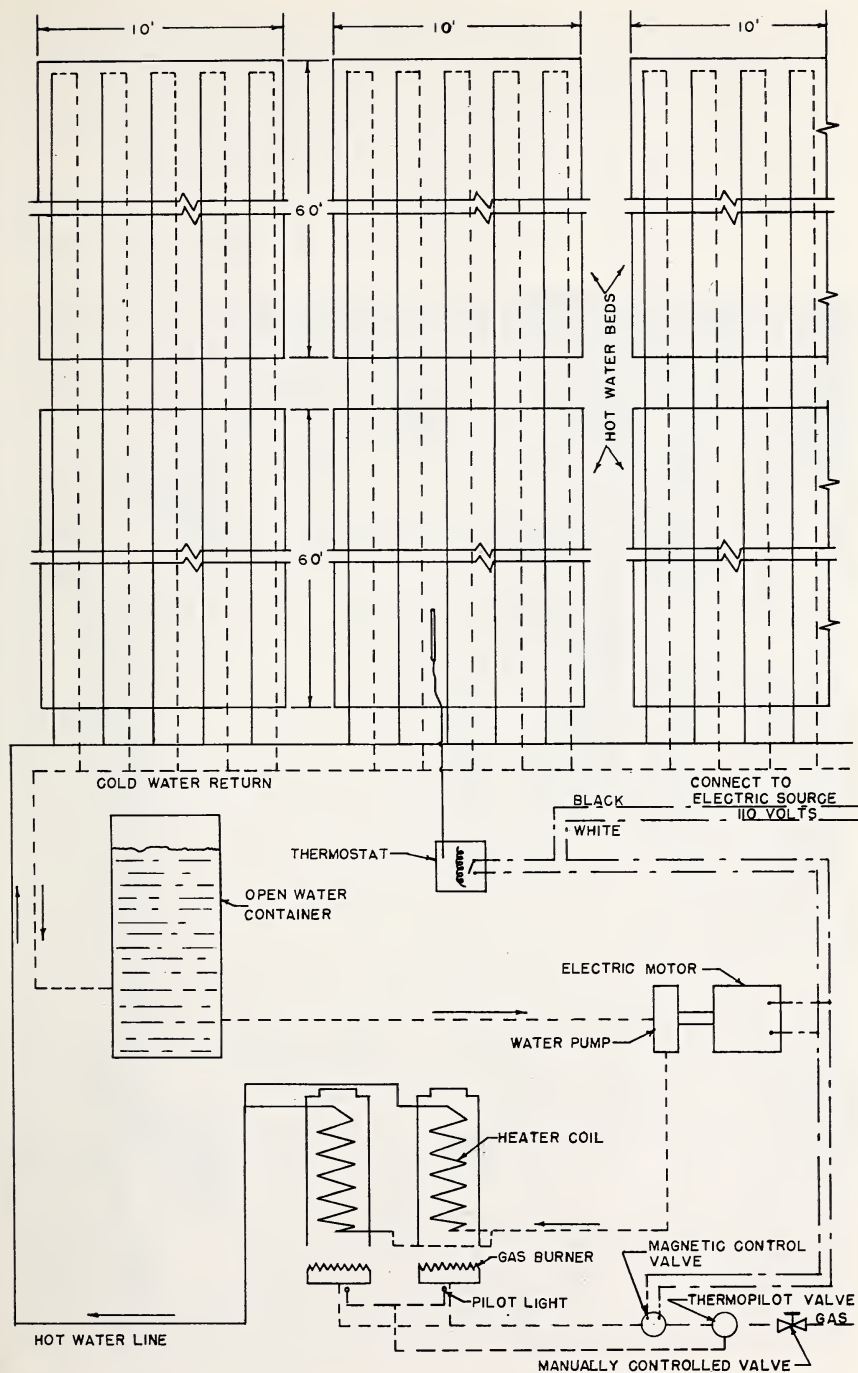


**FIGURE 9.—Typical design for a six-bed, hot-water-heated hotbed showing water lines, pumps, hot-water heater, and electrical controls.**

24 BTU per square foot of bed.) Multiplying the total area of the hot-beds by 24 will give the amount of heat necessary for the installation. It is wise to allow an additional 4 to 5 per cent of heat requirement to compensate for the heat lost in the header lines. If the header lines are to run as far as 50 feet from the coil heater, then some type of waterproof insulation should be placed on the header pipes.

**The Hot-Water Heater.**—Hot-water coil type heaters are usually used for heating the water since they are smaller and more compact

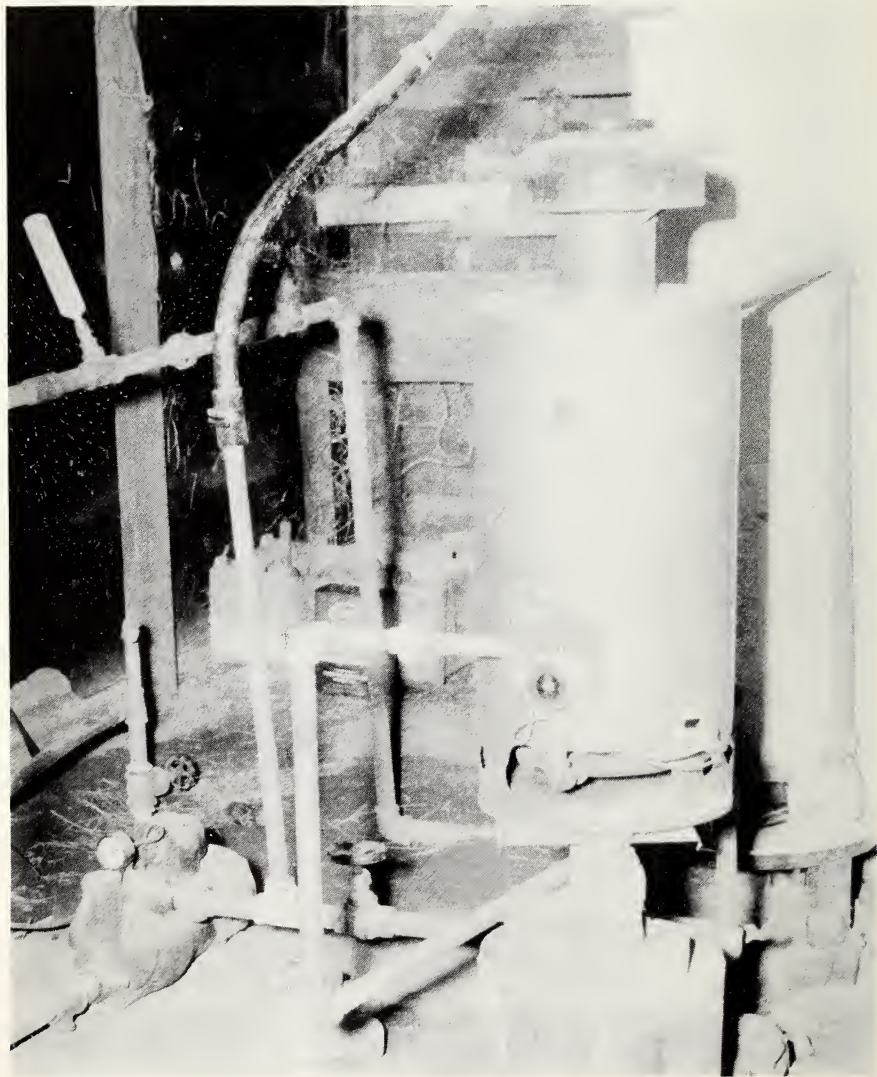


**FIGURE 10.**—Coil heater and pump for hot-water-heated hotbed.

for a given capacity compared to the regular hot-water tank-type heaters. Figure 10 shows a coil and a tank-type of water heater being used together as a source of hot water for a hotbed installation. It is often necessary to use more than one heater to get the required hot water for a large installation such as shown in Figure 9. To reduce the friction of the water in going through the heater coils, they should be installed in parallel in the system instead of in series. This will divide the water going through each heater and reduce pumping head pressure. The parallel type of connection is shown in Figure 9.

Hot-water heaters, both coil and tank types, together with suitably matched gas burners can be obtained from most hot-water heater manufacturers. These heaters are rated in either BTU per hour (input or output) or recovery rate in gallons of water per hour for a certain water temperature rise in degrees Fahrenheit. If a catalog lists only the recovery rate in gallons per hour for a listed temperature rise, then the output in BTU per hour can be calculated by using the following formula:

BTU per hour = gallons per hour x 8.33 x water temperature rise in degrees F.

Only the output rating can be used in arriving at the proper size heater. Some catalogs will list only the input rating, which should not be taken as the output rating of the water heater. For example, a typical listing for a hot-water heater is as follows: Model 30M, 30 gals. capacity, input rating in BTU per hr. is 30,000, recovery rate in gals. per hr. is 42 for a 60° F. rise. Using the formula given above, the output rating for this heater can be calculated as follows: BTU per hour = 42 x 8.33 x 60. This equals 20,000 BTU per hour output rating. The actual output of a heater unit is usually 30 per cent lower than the input rating. So if only the input rating is listed, reducing it by 30 per cent will give the approximate output in BTU per hour.

**The Pump.**—From field tests it was found that the average temperature drop of hot water in circulating through the hotbeds is from 10° to 12° F. when holding the hotbeds at a temperature of 83° to 85° F. To maintain this temperature in the hotbeds, the hot water must leave the pump at a temperature of 90° to 92° F. and it will return at a temperature of 78° to 80° F. A reduction in water temperature greater than 12° F. is not recommended. Under these conditions a certain amount of heated water must be circulated. The amount of heated water required can be determined from the following formula:

For a 12° F. reduction in temperature

$$\text{Water in gallons per minute} = \frac{\text{Total BTU per hr.}}{6,000}$$

For a 10° F. reduction in temperature

$$\text{Water in gallons per minute} = \frac{\text{Total BTU per hr.}}{5,000}$$

As an example, assume that the heat required for a hotbed installation is 70,000 BTU per hour and a 10° F. drop in water temperature

is allowed. Then the heated water that must be pumped through the system would be  $\frac{70,000}{5,000}$  or 14 gallons per minute.

In selecting a pump to circulate this heated water, not only must the amount of water to be pumped per minute be calculated, but also the friction head that the pump must operate against must be determined. The friction in the pipe will vary with the size of the pipe and the amount of water being pumped through it. The smaller the pipe, the greater the resistance in forcing the same amount of water through it. Figure 11 gives the resistance head in feet of water per 100 feet of pipe for various quantities of water that will be circulated through the hotbed.

To prevent a large temperature drop in the hot-water line in the hotbed, the line connected to the hot-water header is run the length of the bed, then returns and discharges into the cold-water header line. This is commonly referred to as a loop of line. Since these loops of hot-water lines are spaced one foot apart, it takes five such loops for a 10-foot-wide hotbed. If the installation is three hotbeds wide, as shown in Figure 9, then 15 loops of hot-water line are required. Assuming that the amount of hot water to be circulated was calculated to be 18 gallons per minute, then 18 divided by 15 equals 1.2 gallons per minute per loop of line. Assuming that the length of line per loop is a total of 200 feet, then from the graph in Figure 11 the resistance per loop would be .8 foot of head per 100 feet of  $\frac{3}{4}$ -inch pipe. Thus for a 200-foot loop it would be 1.6 feet. The resistance, then, for the whole system of  $\frac{3}{4}$ -inch hot-water lines would be  $1.6 \times 15$ , or 24 feet of head. Assuming that  $1\frac{1}{4}$ -inch pipe was selected for the hot- and cold-water header lines and that the length of these lines totaled 150 feet, then the resistance for the header lines can be obtained from Figure 11 as 9.2 feet of head per 100 feet of line for 18 gallons per minute. So  $9.2 \times 1.5$  equals 13.8 feet of head. The total resistance for the system would be  $24 + 13.8$ , or 37.8 feet of head.

After the gallons per minute to be pumped and the total friction head that the pump must operate against have been determined, a pump can be selected for the hot-water system from a manufacturer's catalog.

**Example in Selecting the Heater and the Pump.**—The following calculations show how the size of the heating system and motor-pump unit can be determined for a hot-water-heated hotbed such as the one shown in Figure 9. The total area of the six beds will be 3,600 square feet. Using the round figure of 24 BTU per square foot as arrived at previously, the necessary heat to be supplied the hotbed will be 86,400 BTU per hour. Allowing 3,600 BTU for heat loss in the header line will bring the total heat necessary to 90,000 BTU per hour. This heat will have to be supplied by the circulating water.

From a heater company catalog select a coil heater whose capacity in BTU per hour output of heated water equals the calculated heat



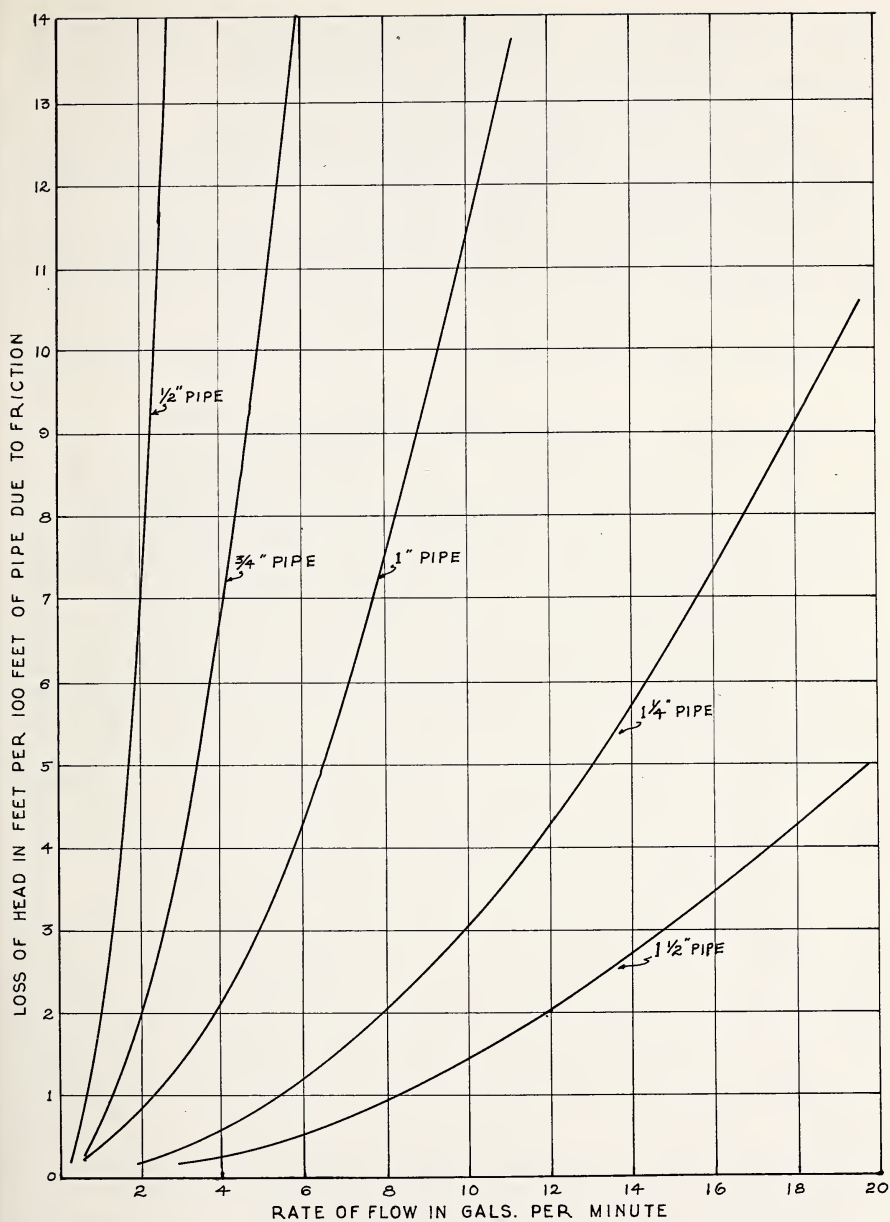


FIGURE 11.—Friction of water in pipes.

required for the hotbed system. It will be necessary to use two heaters as shown in Figure 9. In this event, it is recommended that the heaters be connected in parallel as shown so that the resistance to passing the water through the coils is at a minimum.

Allowing a 10° F. drop in water temperature, the hot water pumped to the beds will be 90° F. and the return water 80° F. The thermostat in the hotbed will be set to hold 85° F.

Using the formula for determining the gallons of heated water to be circulated for a 10° F. drop in temperature (Page 19), calculations are as follows:

$$\text{Water in gals. per minute} = \frac{90,000}{5,000}, \text{ or } 18 \text{ gals. per minute.}$$

This is the total amount of water circulated for all hotbeds.

The hotbeds are laid out so that the water lines run the length of two beds, as shown in Figure 9. The length of one loop of line is twice the distance of the hotbeds plus twice the space between the two beds plus twice the distance from the hotbed to the supply header line. In this case, the hotbeds being 60 feet long, the length of pipe for one way would be about 132 feet, or 264 feet for a complete loop.

By above calculations, 18 gallons per minute was determined for the entire installation, which consists of 15 loops. Thus each loop will receive 1.2 gallons of water per minute. Since the length of the two beds is greater than 100 feet,  $\frac{3}{4}$ -inch pipe will be used in the beds. Referring to the chart in Figure 11, for the  $\frac{3}{4}$ -inch pipe at 1.2 gallons per minute, a resistance head of .9 foot per 100 feet can be expected. Since each loop consists of 264 feet of  $\frac{3}{4}$ -inch pipe, the resistance per loop is  $2.64 \times .9$ , or 2.38 feet. There are 15 loops for the installation; so  $15 \times 2.38$  equals 35.7 feet of head for the  $\frac{3}{4}$ -inch heating lines.

The supply and return header lines at the head of the beds can be  $1\frac{1}{4}$  inches in diameter, and assuming that the heaters and pump are within 35 feet of the hotbeds, then the total length of the header lines will be the width of the hotbeds as laid out (50 feet, including 10-foot alleys) plus the 35 feet to the pump, or 85 feet per line. For the two header lines this would be 170 feet. For all practical purposes it can be assumed that all the water from the pump passes through the total length of this line. From Figure 11 for a  $1\frac{1}{4}$ -inch pipe handling 18 gallons per minute of water, the resistance is 9.2 feet of head per 100 feet of pipe. So the total resistance for the header lines would be  $1.7 \times 9.2$ , or 15.64 feet of head. The total resistance that the pump would operate against then would be 35.7 plus 15.64, or 51.34 feet of head.

In this example the required pump volume was calculated as 18 gallons per minute and the resistance head as 51.34 feet of water. A direct driven motor-pump that will meet these requirements can be selected from a pump catalog. This would be a  $\frac{3}{4}$ -inch centrifugal pump driven by a  $\frac{3}{4}$ -h.p. electric motor.

**Advantages and Disadvantages of Hot-Water System.**—The chief

advantage of the hot-water system is the low cost of operation due to the plentiful source of natural gas in Louisiana. Butane gas can be used where natural gas is not available. The first cost of the pump, heater coils, and pipes makes it the most expensive system to set up, but according to operational results for the past several years, this high first cost is quickly offset by the low operational cost for a large hotbed system. It requires the same amount of labor for tending as the electric heating system. It has a low replacement or upkeep cost, as the pipes are never damaged when replacing the soil in the hotbed as is sometimes the case for the electric heating cable. Its chief disadvantage is that it cannot be installed on a small size hotbed since the smallest motor-pump unit and coil heater are too large and expensive for a small installation.

## **Operating the Hotbed**

### **Thermostat Adjustment**

The thermostat is the instrument that keeps the bed at the proper temperature when electric cable or circulating hot water is used. It should be checked before putting the hotbed into operation each spring. Some thermostats have degree markings on the adjustment screw dial. It should never be taken for granted that these graduations are correct until proved by testing. The temperature setting can be adjusted in the following manner: Place the thermostat bulb in a container of water which is heated to 85° F. as measured by a reliable thermometer. At this temperature the electrical contacts should separate or be adjusted to separate. Then cool the water to 80° F.; the contacts should then come together again. For adjusting the setting the adjustment screw on the thermostat can be turned counter-clockwise to raise the temperature and clockwise to lower the temperature setting.

When the proper thermostat setting has been determined, the bulb should be placed in the bed at the same level as the potatoes. A soil thermometer should be inserted in the bed to the depth of the potatoes and preferably located so that it can be read without disturbing the cover. The thermometer should be read daily to ascertain that the bed is heating properly. After the heat is turned on the bed should warm up to 80° to 85° F. in a couple of days.

### **Cover**

It is necessary to have cloth, glass, glass substitutes, or plastic to cover the bed at night if economical operation is expected. In order to conserve fuel the cover should remain over the bed during cool, cloudy days.

### **Watering**

The bed should be watered after the potatoes are placed in it. Watering thereafter will depend on the type of heat and weather conditions, but frequency of watering will be from once to twice a week.

## Ventilation

When the sprouts begin to appear in the hotbed the cover will have to be rolled back from the beds on bright, sunny days from about nine in the morning until about five in the afternoon. If the cover is left over the bed during a hot summer day the plants may become scorched. After the plants become older the heat may be turned down and the cover left off to harden the plants before pulling for field setting, but danger of frost must be watched.

## Storage

When the hotbed season is over, a little attention given the beds can prove a big saving over a period of years. A cloth or plastic cover will last several seasons if it is dried out, rolled up, and stored away in a dry place. The potato bedding soil should be removed and the bed aired until ready for refilling the next season. Electricity should be cut off from the bed and the thermostat stored out of the weather.

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# **THE STATUS OF MEATS**

**As Interpreted from  
Projective  
Meal Situations**

**by Betty L. Woods  
and Ganata Jo Nettles**

Bulletin No. 557

October 196

Louisiana State University and  
Agricultural and Mechanical College  
Agricultural Experiment Station  
Charles W. Upp, Director

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## Southern Regional Research Project SM 19

This report contains findings from a portion of a study that is a contributing project to Southern Regional Research Project SM 19, "Motivational Factors in Consumer Purchases of Beef as Related to Objective Measurements Used to Predict Beef Acceptability." This study relates to the objective, "To Determine and Appraise the Motivation Factors that Affect Consumers in Their Purchase of Beef," on which the Agricultural Experiment Stations of Texas, Alabama and Georgia also have projects.



# Status of Meats as Interpreted from Projective Meal Situations

BETTY L. WOODS\* AND GANATA JO NETTLES\*\*

The status or importance that a consumer-buyer attaches to various kinds and cuts of beef affects her decisions in the retail market. Although status is only one of the many factors that influence consumers in their purchase of beef, it is an important one. A better understanding of the status of various kinds and cuts of beef, as well as other factors, should enable the producer and handler to better supply the consumer with the product she desires and thereby benefit the producer, the handler and the consumer alike.

One way to determine the status of various cuts of beef and of other meats is to learn the kinds of meals with which consumers associate these cuts. An attempt was made to do that in this study. Meal situations denoting both high and low status were used in a questionnaire to determine the kinds and cuts of meat that respondents associated with these meals.

This report includes results from one segment of a personal interview study concerning motivations in beef purchases. The questions relating most directly to the "status" of kinds and cuts of meat were analyzed and are reported in this bulletin. Findings relating to other factors that influence consumer choices are reported in another bulletin.

Since reactions to direct questions concerning real motivations may sometimes be hard for the respondent to verbalize, and in some cases she may not be aware of the actual motivating factors, indirect and projective-type questions were used in this study.

## Procedure

A survey was made in the spring of 1960 of families in Shreveport, Lake Charles and Monroe, Louisiana, three of the state's largest cities excluding New Orleans and Baton Rouge. The sample was randomly drawn from households listed in Polk's City Street Directory of each city. To reduce travel time between households, the sample elements were drawn in clusters of five.

In each city, interviewers were hired and trained by the Home Economics Marketing Research Staff. House-to-house interviews were conducted and data were obtained from the homemaker or the person mainly responsible for purchasing the meat. Interviewers made at least

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four attempts to contact each sample household before an alternate was taken.

The schedule was finalized after a review of the results of a large-scale pilot study made of 100 families selected at random from households in Baton Rouge. The schedule included direct questions, indirect questions, and cartoons and situations which were projective in nature. The projective techniques used were designed with the aim of obtaining attitudes and feelings toward beef and marketing practices that might not have been verbalized by the respondents. The appendix includes the actual questions from which the data reported in this bulletin were obtained (Form 1).

Data from the schedules were edited, coded, and punched into IBM cards. Summary tables were made from the IBM answer sheets. These data were then analyzed by the Home Economics Marketing Research Staff.

## **Summary of Findings**

For all the meal situations used in this survey, beef was suggested more than twice as often as any other kind of meat. When situations were categorized as high status meals and low status meals, beef again was listed more than twice as often as any other kind of meat for both types. Beef loin steak was mentioned most frequently for meal situations of high status while ground beef was reported most often for low status meals.

In a meal situation for an important man guest, beef loin steak was selected more than four times as often as any other cut of meat. Chicken was suggested most frequently for a special woman guest, three times as often as any other cut of meat. Beef loin steak was listed more than twice as often by respondents for a meal to impress a couple. For the Sunday dinner meal situation, chicken was reported more than twice as often as any other meat. Ground beef was suggested more than twice as often as any other cut for a meal prepared by a busy housewife and for a regular inexpensive meal. As the meat to serve a large family with several small children, ground beef was listed most frequently, with chicken second.

### **Influence of Demographic Factors on Kinds of Meat**

As income increased, the percentage of respondents reporting beef loin steak for the three high status meals increased. As income increased, the number of respondents suggesting poultry for meals for an important man guest and to impress a couple decreased. Income seemed to make no difference in poultry suggestions for a special woman guest.

Beef loin steak was listed much more often by white than by non-white respondents for meals for an important man guest and to impress a couple. Nonwhite families suggested poultry more often for these situations.

As occupation of husband increased in status, the suggestions for beef loin steak for meals for an important man guest and to impress a couple



increased, and suggestions for poultry for these meals decreased. These same trends were true as level-of-living scores increased.

Education of the homemaker and education of the husband in almost every case paralleled each other in influence on cuts of meat suggested. The personal data factors affected the suggestions of ground beef for low status meals very little. Occupation of the husband had slightly more influence in that as occupational status increased, the percentage of respondents listing ground beef decreased.

Income and education of the homemaker affected suggestions of poultry and beef loin steak and roast for a Sunday dinner. As income and education increased, the number of respondents suggesting beef loin steak and roast increased and those suggesting poultry decreased.

### **Methods of Preparation**

Seventy-eight percent of the respondents suggested a dry heat method of preparation for all cuts of meats listed, while almost 32 percent suggested moist heat methods. Of the total tender cuts of beef mentioned, 89 percent indicated that they would prepare them by dry heat methods. Of the less tender cuts of beef, 69 percent recommended moist heat methods of preparation.

Status of meals did not seem to greatly influence the method of cooking tender cuts of beef. For high status meals, almost 92 percent listed dry heat methods for tender cuts, and, for low status meals, almost 88 percent suggested dry heat. The method of cooking less tender cuts of beef seems to have been affected by the status of the meal situation. For less tender beef, 45 percent of the respondents indicated dry heat methods for high status meals, while 14 percent suggested dry heat methods for low status meals.

For tender cuts of beef, those suggesting broiling increased as the educational level increased. Those suggesting frying decreased as education increased. For less tender cuts of beef, education did not seem to affect the percentage of respondents who suggested pot roasting. As education increased, there was an increase in those suggesting baking or roasting the less tender cuts.

As education increased, there was an increase in those who suggested cooking the tender cuts of beef without liquid and a decrease in those who suggested preparing the tender cuts with added moisture and in the percentage who suggested cooking in fat.

As the educational level increased, there was a decrease in those suggesting cooking the less tender cuts with added moisture and an increase in those who suggested cooking these cuts without added liquid.

## **Description of the Sample**

Demographic factors of the consumer families will be discussed briefly since these factors may be basic to motivations influencing their preferences for and uses of meats. Grouped according to factors per-

taining to socio-economic level, individual families represented a wide range in income, educational level, occupation and level-of-living.

Forty-seven percent of the families studied reported an annual income of less than \$4,000. An annual income of \$4,000 to \$8,000 was re-

**TABLE 1.—Demographic Data Concerning Families in the Sample**

| Classification                | Number | Percent |
|-------------------------------|--------|---------|
| <b>Race</b>                   |        |         |
| White                         | 427    | 72.6    |
| Nonwhite                      | 161    | 27.4    |
| <b>Family Income</b>          |        |         |
| Under \$4,000                 | 278    | 47.1    |
| \$4,000 through \$7,999       | 208    | 35.5    |
| \$8,000 and over              | 99     | 17.0    |
| No answer or don't know       | 3      | 0.3     |
| <b>Occupation of Husband</b>  |        |         |
| Professional                  | 153    | 26.0    |
| Clerical                      | 39     | 6.7     |
| Skilled                       | 151    | 25.7    |
| Service                       | 72     | 12.2    |
| Unemployed                    | 52     | 8.0     |
| No husband in house           | 119    | 20.2    |
| No answer                     | 2      | 0.3     |
| <b>Education of Husband</b>   |        |         |
| Elementary                    | 151    | 25.7    |
| High school                   | 185    | 31.5    |
| College                       | 142    | 24.2    |
| No husband in house           | 100    | 17.0    |
| No answer or don't know       | 10     | 1.8     |
| <b>Level-of-Living Scores</b> |        |         |
| 0 through 2                   | 89     | 15.2    |
| 3 through 5                   | 248    | 42.2    |
| 6 through 8                   | 148    | 25.2    |
| 9 through 11                  | 66     | 11.1    |
| 12 through 18                 | 37     | 6.2     |
| <b>Education of Homemaker</b> |        |         |
| Elementary                    | 156    | 26.6    |
| High school                   | 287    | 48.8    |
| College                       | 139    | 20.6    |
| No wife in house              | 5      | 0.9     |
| No answer or don't know       | 2      | 0.4     |
| <b>Age of Husband</b>         |        |         |
| Under 30 years                | 69     | 11.7    |
| 30 to 50 years                | 252    | 42.8    |
| 50 and over                   | 139    | 23.7    |
| No answer                     | 128    | 21.7    |

(Continued)

**TABLE 1—(Continued)**

| Classification                         | Number | Percent |
|----------------------------------------|--------|---------|
| <b>Age of Homemaker</b>                |        |         |
| Under 30 years                         | 121    | 20.5    |
| 30 to 50 years                         | 281    | 47.8    |
| 50 and over                            | 168    | 28.6    |
| No answer                              | 18     | 3.1     |
| <b>Homemaker's Employment Schedule</b> |        |         |
| Full-time employed                     | 133    | 22.6    |
| Part-time employed                     | 41     | 6.9     |
| Full-time homemaker                    | 406    | 69.1    |
| No answer                              | 8      | 1.4     |
| <b>Occupation of Homemaker</b>         |        |         |
| Unskilled                              | 74     | 12.6    |
| Clerical                               | 53     | 9.0     |
| Professional                           | 45     | 7.7     |
| Homemaker                              | 406    | 69.0    |
| No answer                              | 10     | 1.7     |
| <b>Area Where Respondent Grew Up</b>   |        |         |
| Louisiana                              | 408    | 69.4    |
| Other southern states                  | 113    | 19.2    |
| Other                                  | 66     | 11.2    |
| No answer                              | 1      | 0.2     |
| <b>Number of Persons in House</b>      |        |         |
| One                                    | 61     | 10.4    |
| Two                                    | 160    | 27.2    |
| Three to five                          | 289    | 49.1    |
| Six or more                            | 76     | 13.0    |
| No answer                              | 2      | 0.3     |
| <b>Years in Louisiana</b>              |        |         |
| Less than one                          | 20     | 3.4     |
| One to five                            | 47     | 8.0     |
| Six to ten                             | 18     | 3.1     |
| More than ten                          | 494    | 84.0    |
| No answer                              | 9      | 1.5     |
| <b>Home ownership</b>                  |        |         |
| Owned                                  | 369    | 62.8    |
| Rented                                 | 210    | 35.7    |
| Other                                  | 9      | 1.5     |
| <b>Family Religion</b>                 |        |         |
| Protestant                             | 466    | 79.3    |
| Catholic                               | 90     | 15.3    |
| Catholic and Protestant                | 21     | 3.6     |
| Jewish                                 | 6      | 1.0     |
| Other                                  | 4      | 0.7     |
| No answer                              | 1      | 0.2     |

TABLE 2.—Number of Persons in Sample from Each City

| City         | Population | Number in Sample |
|--------------|------------|------------------|
| Lake Charles | 89,115     | 180              |
| Monroe       | 80,546     | 212              |
| Shreveport   | 208,583    | 196              |

ported by 36 percent of the total families. Seventeen percent of the families could be placed in the high income group (\$8,000 and over). The median family income for the state is \$4,272, according to the U.S. Census Bureau, *Statistical Abstract of United States 1961*.

The level of education of the husbands and homemakers, respectively, was: (1) none or elementary, 26 and 27 percent; (2) high school, 32 and 49 percent; and (3) college and other, 24 and 23 percent. (Eighteen percent of the homemakers reported no husband or did not respond.)

The husbands' occupations were categorized into five groups. The professional group included professional, technical, managerial and kindred workers. The next group, clerical, was composed of clerical, sales and kindred workers. The skilled category included craftsmen, foremen, operators and kindred workers. Service workers and laborers were grouped as service. The final group, unemployed, included those who were unemployed or retired. Twenty-six percent of the husbands held professional positions, 26 percent were skilled workers, 12 percent were service workers, 8 percent were unemployed and 7 percent were clerical workers.

The majority of the women, 69 percent, were full-time homemakers—they did not work for pay outside the home. Approximately one-fourth of those who worked outside the home were "part-time" workers. Almost two-thirds of the families owned their own homes. The majority of the homes, about 70 percent, ranged in size from four to seven rooms.

The level-of-living score for each respondent was obtained from a list of goods and services available in the respondents' homes. This list included central heating system, freezer, telephone, bathroom, automobile, air conditioning unit, central air conditioning system, maid and television. Respondents were given one point for each item owned except for central heating and central air conditioning systems, which rated two and four points, respectively. If the respondents owned two or more of any item, they received two points for that category. The level-of-living scores were grouped into five categories. The highest possible score for any respondent was 20. About two-fifths of the respondents scored from 3 through 5. One-fourth had a score from 6 through 8. Fifteen percent ranked in the first group, 0 through 2. Fewer respondents (6 percent) fell into the highest group, scoring 12 through 18.

The average household interviewed in this sample consisted of 3.4 persons, which compares favorably with the average of the state as a whole—3.57, as reported by the U.S. Census Bureau, *Statistical Abstract of United States 1961*. Almost 50 percent of the homemakers and about



43 percent of the husbands were between 30 and 50 years of age. The percentages for homemakers who were younger and older than this were greater than percentages for husbands. About one-fifth of the homemakers did not report a husband.

Respondents who had grown up in Louisiana (48 percent in North Louisiana and 22 percent in South Louisiana) represented about 70 percent of the total sample. Almost 20 percent had grown up in another southern state. Most of the respondents (84 percent) had lived in Louisiana more than 10 years.

Grouped according to race, about 73 percent of the respondents were white and 27 percent were nonwhite. According to the 1961 census by population of the state, 67.9 percent of the people in Louisiana are white and 32.1 percent are nonwhite. The predominant religion was Protestant, accounting for 79 percent of all families. Slightly over 15 percent were Roman Catholic, and most of the remaining families were Jewish or reported mixed marriages (Table 1).

The sample consisted of 588 households, of which 212 were located in Monroe, 196 in Shreveport and 180 in Lake Charles (Table 2).

## Kinds and Cuts of Meat Suggested for All Meal Situations

The kind of meat selected for any meal situation and the method of preparing meats in the home gives some indication as to the status or importance the consumer attaches to the kinds and cuts of meat. In order to analyze the status of meats and meat preparation methods,

**TABLE 3.—Total Number of Times All Cuts of Meat Were Suggested**

| Cut of Meat               | Number       | Percent      |
|---------------------------|--------------|--------------|
| Poultry, chicken          | 853          | 20.7         |
| Beef, ground              | 670          | 16.3         |
| Beef, loin steak          | 615          | 14.9         |
| Beef, miscellaneous       | 310          | 7.5          |
| Pork, ham                 | 218          | 5.2          |
| Beef, round or rump roast | 216          | 5.2          |
| Beef, round steak         | 185          | 4.5          |
| Pork, chops and steaks    | 185          | 4.5          |
| Beef, loin roast          | 172          | 4.2          |
| Seafood, all types        | 154          | 3.7          |
| Veal, chops and steaks    | 142          | 3.4          |
| Beef, chuck roast         | 130          | 3.2          |
| Pork, roast               | 54           | 1.3          |
| Pork, miscellaneous       | 51           | 1.2          |
| Lamb, all types           | 32           | 0.8          |
| Poultry, turkey           | 30           | 0.7          |
| Veal, roast               | 23           | 0.6          |
| Veal, miscellaneous       | 22           | 0.5          |
| Poultry, other            | 11           | 0.3          |
| Beef, chuck steak         | 6            | 0.1          |
| Miscellaneous             | 37           | 0.9          |
| <b>TOTAL</b>              | <b>4,116</b> | <b>100.3</b> |

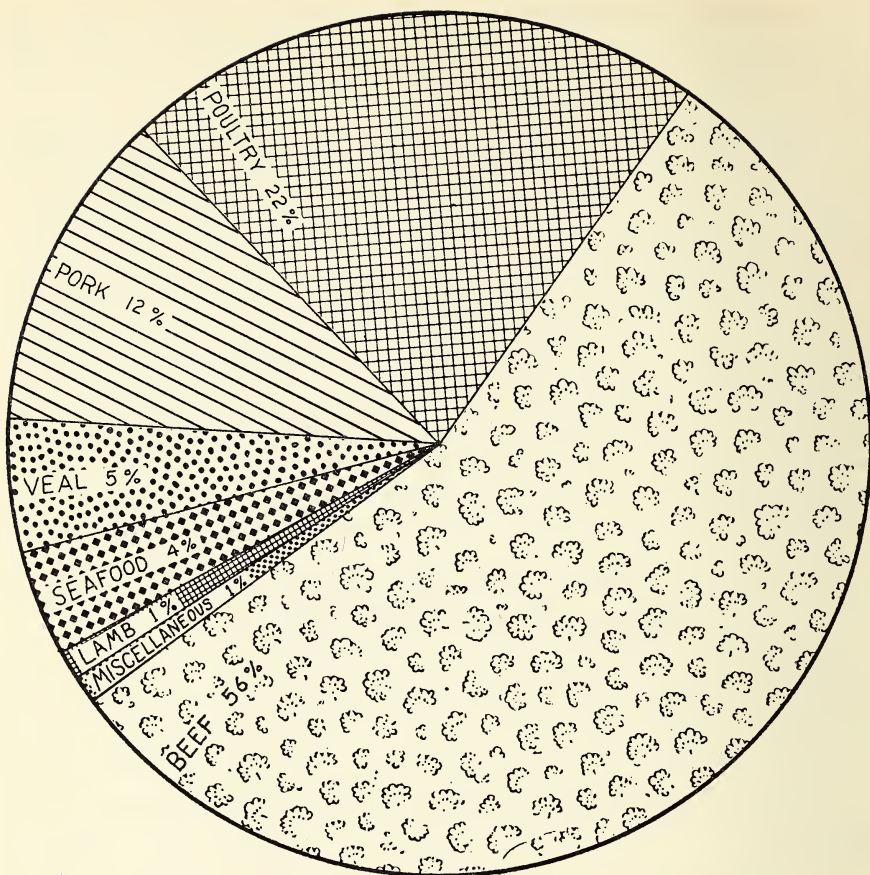


Fig. 1.—Percentages of All Kinds of Meat Suggested for Meal Situations.

respondents were asked, through a series of projective type situations, to suggest kinds of meat and the methods of preparation for a meal to be served (1) to an important man guest, (2) to a special woman guest, (3) to a couple they would like to impress, (4) at a Sunday dinner, (5) by a busy housewife, (6) for an inexpensive regular evening meal and (7) to a large family with several young children (Appendix, page 21).

The kinds of meats suggested by the respondents included beef, veal, seafood, poultry, pork, lamb and a few miscellaneous kinds. Grouped according to kind of meat only, beef was the most popular, comprising 56 percent of the total choices. Poultry ranked second in this grouping with 22 percent. Then came pork, 12 percent; veal, 4 percent; seafood, 4 percent; and lamb, 1 percent (Figure 1).

Meat suggestions were analyzed also by cuts to determine the ranking of cuts as well as kinds of meat. When cuts were ranked according to frequency of selection, chicken ranked first (21 percent). Ground beef (16

**TABLE 4.—The Percentages of Suggestions of Various Kinds and Cuts of Meat  
for Each Meal Situation**

| Kind and cut of meat   | Meal Situations                |                           |                         |                  |                        |                                     |                                     |
|------------------------|--------------------------------|---------------------------|-------------------------|------------------|------------------------|-------------------------------------|-------------------------------------|
|                        | Im-<br>portant<br>man<br>guest | Special<br>woman<br>guest | Couple<br>to<br>impress | Sunday<br>dinner | Busy<br>house-<br>wife | Regular<br>inex-<br>pensive<br>meal | Family<br>with<br>small<br>children |
|                        |                                |                           | — — — Percent — — —     |                  |                        |                                     |                                     |
| Beef, loin steak       | 47.6                           | 12.2                      | 32.0                    | 1.7              | 8.0                    | 1.5                                 | 1.5                                 |
| Beef, loin roast       | 7.1                            | 2.7                       | 3.4                     | 9.7              | 0.3                    | 1.2                                 | 4.8                                 |
| Beef, steak            | 7.3                            | 5.6                       | 5.4                     | 2.2              | 4.6                    | 3.1                                 | 3.2                                 |
| Beef, round/rump roast | 7.7                            | 4.4                       | 3.4                     | 14.1             | 1.5                    | 0.5                                 | 5.1                                 |
| Beef, chuck steak      | 0.2                            | 0.0                       | 0.2                     | 0.0              | 0.0                    | 0.5                                 | 0.2                                 |
| Beef, chuck roast      | 3.2                            | 1.5                       | 1.4                     | 7.5              | 1.7                    | 1.9                                 | 4.9                                 |
| Beef, ground           | 1.2                            | 2.9                       | 3.7                     | 3.4              | 29.9                   | 38.8                                | 34.0                                |
| Beef, stew             | 0.0                            | 0.5                       | 0.3                     | 0.9              | 2.9                    | 10.0                                | 11.2                                |
| Beef, miscellaneous    | 1.7                            | 1.8                       | 2.1                     | 2.8              | 7.0                    | 7.9                                 | 3.5                                 |
| BEEF (TOTAL)           | 76.0                           | 31.6                      | 51.9                    | 42.3             | 55.9                   | 65.4                                | 68.4                                |
| Poultry, chicken       | 10.7                           | 39.3                      | 14.1                    | 37.9             | 3.7                    | 14.5                                | 24.8                                |
| Poultry, turkey        | 0.2                            | 0.3                       | 3.9                     | 0.5              | 0.2                    | 0.0                                 | 0.0                                 |
| Poultry, other         | 0.0                            | 0.7                       | 1.0                     | 0.2              | 0.0                    | 0.0                                 | 0.0                                 |
| POULTRY (TOTAL)        | 10.9                           | 40.3                      | 19.0                    | 38.6             | 3.9                    | 14.5                                | 24.8                                |
| Pork, ham              | 2.9                            | 4.6                       | 8.7                     | 9.9              | 7.5                    | 2.4                                 | 1.2                                 |
| Pork, chops & steaks   | 2.2                            | 5.4                       | 2.0                     | 0.5              | 14.1                   | 6.5                                 | 0.7                                 |
| Pork, roast            | 1.4                            | 1.4                       | 1.0                     | 4.1              | 0.3                    | 0.5                                 | 0.5                                 |
| Pork, miscellaneous    | 0.3                            | 0.3                       | 1.5                     | 0.7              | 1.7                    | 3.7                                 | 0.3                                 |
| PORK (TOTAL)           | 6.8                            | 11.7                      | 13.2                    | 15.2             | 23.6                   | 13.1                                | 2.7                                 |
| Veal, chops & steaks   | 3.2                            | 5.6                       | 2.4                     | 0.5              | 10.4                   | 1.2                                 | 0.9                                 |
| Veal, roast            | 0.2                            | 0.9                       | 0.2                     | 1.5              | 0.3                    | 0.3                                 | 0.5                                 |
| Veal, other            | 0.0                            | 0.5                       | 0.0                     | 0.2              | 0.9                    | 1.7                                 | 0.5                                 |
| VEAL (TOTAL)           | 3.4                            | 7.0                       | 2.6                     | 2.2              | 11.7                   | 3.2                                 | 1.9                                 |
| SEAFOOD (TOTAL)        | 1.7                            | 6.5                       | 10.5                    | 0.5              | 3.1                    | 2.7                                 | 1.2                                 |
| LAMB (TOTAL)           | 0.7                            | 2.0                       | 1.5                     | 0.5              | 0.3                    | 0.2                                 | 0.2                                 |
| MISCELLANEOUS          | 0.5                            | 0.9                       | 1.2                     | 0.7              | 1.0                    | 1.0                                 | 0.7                                 |
| TOTALS                 | 100.0                          | 100.0                     | 99.9                    | 100.0            | 99.4                   | 100.1                               | 99.9                                |

percent) was listed second most frequently and beef loin steak (15 percent) was third. Other cuts of meat were chosen in this order: beef round or rump roast, 5 percent; beef round steak, 5 percent; pork chops and steak, 5 percent; pork ham, 5 percent; beef loin roast, 4 percent; all kinds of seafood, 4 percent (Table 3).

### Meats for Various Meal Situations

When the data were examined by kinds of meat, beef ranked first, poultry second and pork third as suggestions for meal situations for "an important man guest," "to impress a couple," for "Sunday dinner,"

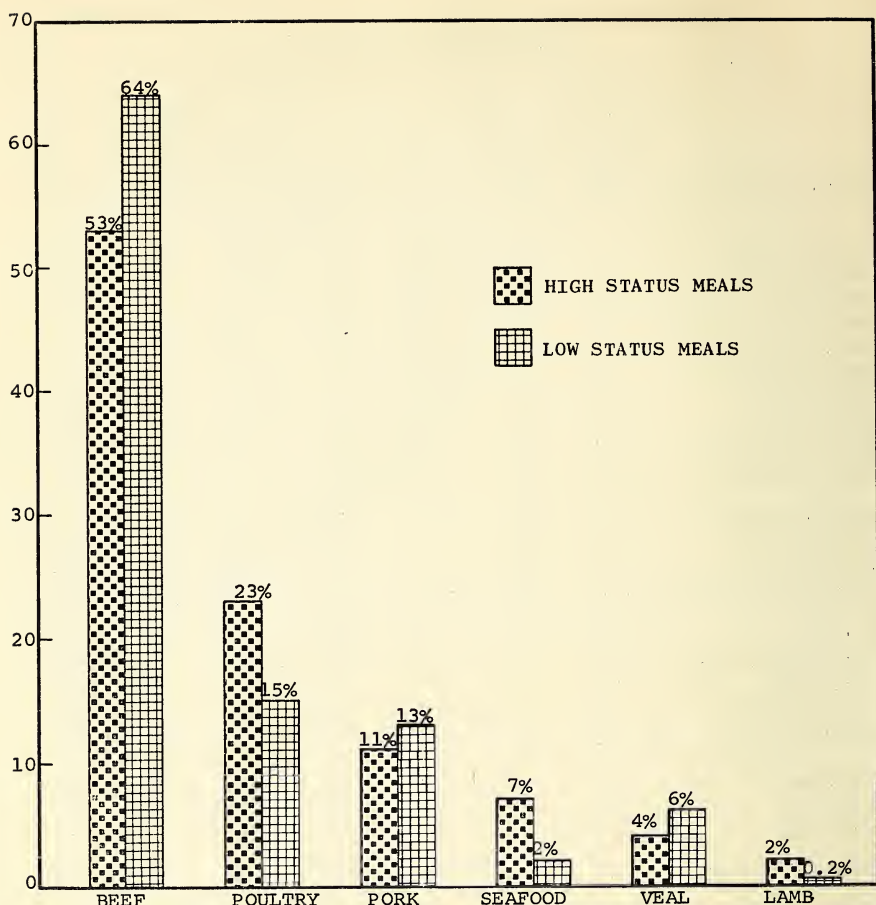


Fig. 2.—Kinds of Meat Suggested for High and Low Status Meal Situations.

for “an inexpensive regular evening meal” and for “a large family with several young children.” Poultry was reported most often for a meal for “a special woman guest,” followed by beef; then pork. The kinds of meat listed to be served at a meal prepared by “a busy housewife” were beef first, pork second and veal third most often.

Certain differences were evidenced when the meats suggested for each meal situation were further analyzed according to cut. Beef loin steak was reported by almost half (48 percent) of the respondents as a meat to serve “an important man guest” and by one-third of the respondents for a meal “to impress a couple.” Chicken was most often suggested in meal situations for “a special woman guest” (39 percent) and for “Sunday dinner” (38 percent). Ground beef was listed more often for a meal prepared by “a busy housewife” (one-third of the respondents), for an “inexpensive regular evening meal” (39 percent) and for “a large family with several young children” (34 percent). (See Table 4.)



## **Meats for High and Low Status Meals**

Meal situations were grouped according to high and low status meals. The following situations were combined as high status or prestige meals: (1) an important man guest, (2) a special woman guest and (3) a couple to impress. For the low status meals, those for (1) a busy housewife, (2) a regular inexpensive evening meal and (3) a large family with several small children were combined.

Beef was suggested most often for meals in both the high and low status categories. A larger percentage of respondents suggested beef for the low status meals (64 percent) than for high status ones (53 percent). Poultry ranked second in both high and low status meals, but more respondents suggested it for high status (23 percent) than for low status meals (15 percent). Pork accounted for 11 percent of the high status selections and 13 percent of the low status meals.

Seafood rated higher for high status meals (7 percent) than for low status meals (2 percent). Veal accounted for 6 percent of low status meals and 4 percent of high status ones. Lamb was suggested least often for both high and low status meals—2 percent of high status and only 0.2 percent for low status meals (Fig. 2).

## **Influence of Demographic Factors on Meats Suggested for Various Projective Meal Situations**

The findings were analyzed to determine if characteristics of the families seemed to influence meat choices that were made. The characteristics discussed in this bulletin include: (1) race, (2) income, (3) occupation of the husband, (4) level-of-living score, (5) educational level of the homemaker and (6) educational level of the husband. (For detailed information on influence of these factors, see the tabular data presented in Appendix Tables 3 through 9, pages 24 to 37).

### **Important Man Guest**

When the respondents were asked to suggest a meat to be served at a meal for an important man guest, pork was suggested much more often by nonwhite respondents, while white homemakers listed beef more often. The family income was grouped into categories of high (\$8,000 and over), middle (\$4,000 to \$8,000) and low (up to \$4,000). For the important man guest, the high and middle income groups selected beef loin steak much more often than did the lower income group. The low income group reported poultry more often.

The percentage of respondents listing beef loin steak decreased as the status of the occupational position decreased. The homemakers whose husbands were service workers mentioned beef round steak more than twice as often as the other groups.

Respondents were grouped as follows according to level-of-living

scores: Group I (score of 0-2), Group II (score of 3-5), Group III (score of 6-8), Group IV (score of 9-11) and Group V (score of 12-18). Generally as the scores increased, the percentage of respondents listing beef loin steak and roast increased and the percentage suggesting beef round steak and poultry decreased.

As the educational level of the homemaker increased, the percentage of respondents listing beef loin steak and roast increased. As education increased, the percentage of respondents suggesting poultry, pork and beef round steak decreased. Beef loin steak and roast were suggested more often by those respondents whose husbands had some college or high school training than by those respondents whose husbands had elementary training. The reports of poultry and beef round steak decreased as the husband's educational level increased (Appendix Table 3).

### **Special Woman Guest**

For a meat to serve a special woman guest, the white homemakers mentioned beef loin steak more than twice as often as the nonwhite. Beef round steak was listed about twice as often by nonwhite respondents. More nonwhite respondents than white listed poultry.

As income increased, so did the percentage of respondents suggesting beef loin steak and roast for a special woman guest. The lower income group reported beef round steak more often than the middle and high income groups.

Seafood was suggested slightly more often by the respondents whose husbands' occupations were classified as clerical than by any other occupational group. Those homemakers whose husbands were service workers indicated pork chops and steak more often than any other occupational group.

The percentage of those suggesting beef loin steak increased as the educational level of the homemaker increased. Beef round or rump roast was suggested twice as often by the elementary education group as by the other groups of homemakers.

As the educational level of the husband increased, the respondents' selection of ham and beef loin steak increased. The respondents whose husbands had an elementary education listed poultry slightly more often than the other groups (Appendix Table 4).

### **To Impress A Couple**

White respondents mentioned beef in general more than did the nonwhite, whereas pork of all kinds was more popular among the nonwhite respondents for a meal to impress a couple. The white respondents suggested beef loin steak twice as often as the nonwhite, and the nonwhite respondents reported poultry twice as often as the white respondents.

The percentage of respondents reporting beef loin steak increased with income. Poultry and seafood were suggested more often by the lower and middle income groups than by the higher group.

The percentage of respondents who suggested beef loin steak generally decreased as the occupational status of the husband decreased.

Poultry was most often reported by the service and unemployed groups.

As level-of-living scores increased, so did the percentage of respondents listing beef loin steak. Poultry, seafood and ground beef were more frequently suggested by Group I than by any of the other groups, generally decreasing as level-of-living scores increased.

The mention of beef loin steak increased as the educational level of the homemaker increased. Ham was listed much more often by the elementary and high school groups than the college group.

The percentage of respondents suggesting beef loin steak increased with the level of education of the husband. The opposite was true when the respondents listed poultry, beef round steak and ham (Appendix Table 5).

### **Sunday Dinner**

As a meat to serve at Sunday dinner, poultry was suggested slightly more often by the nonwhite respondents than by the white. Beef round or rump roast and beef loin roast were mentioned much more often by white respondents, while the nonwhite respondents listed pork roast four times as often as the white. The nonwhite respondents stated ground beef, round steak and beef stew two to three times as often as did the white respondents.

As income increased, the percentage of respondents suggesting poultry decreased. As income increased, those suggesting beef round or rump roast and beef loin roast increased.

Poultry was suggested slightly more often by those whose husbands' occupations were in either the skilled, service or unemployed category.

Level-of-living scores seemed to make some difference in the suggestions of a meat to serve for Sunday dinner. Beef round or rump roast and beef loin roast were listed less by those who had lower scores, and the percentage increased as the scores increased with the exception of Group IV. The percentage of respondents reporting poultry decreased as the education of the homemaker increased. The reverse was true for beef round or rump roast. As the husband's educational level increased, the percentage of respondents who suggested poultry decreased. As education increased, so did the listings of beef round or rump roast and beef loin roast (Appendix Table 6).

### **Busy Housewife**

Ground beef was suggested by about the same percentage of both nonwhite and white respondents for a meal to be prepared by a busy housewife. The nonwhite respondents listed pork chops and pork steak slightly more frequently than the white. Beef loin steak was chosen twice as often by the white respondents and poultry was reported more than twice as often by nonwhite.

The middle income group listed ground beef slightly more often than the other two groups. The selection of pork chops and steak decreased as the income increased. Veal chops and steak and beef loin steak were suggested more often as the income increased.



As the education of the homemaker decreased, the suggestions of ground beef increased. The opposite was true when listing veal chops and steak and beef loin steak. The level-of-living scores of the respondents and education of the husband seemed to have little effect upon their suggestions of the kind of meat to be served by a busy housewife (Appendix Table 7).

### **Large Family With Young Children**

The kind of meat suggested most frequently by all respondents for a meal for a large family with several young children was ground beef. Poultry was the second highest. Race seemed to make little difference. When all cuts of beef were grouped together, the white respondents suggested beef much more often than the nonwhite.

Slightly fewer respondents in the high income group listed ground beef than in the other groups. As income increased, suggestions of beef stew decreased, and suggestions of beef roast increased.

The level-of-living scores seemed to make little difference in the choice of ground beef. Poultry, second ranking meat, was mentioned slightly less by Group I (with lowest level-of-living scores). Groups I and II mentioned beef stew more often, and beef round or rump roast was suggested more often by Groups IV and V.

The percentage of respondents who reported poultry increased as the education of the homemaker increased. The percentage who listed beef stew decreased as the educational level of the respondents increased. The educational level of the husband seemed to make little difference in the kind of meat selected most often for a large family with several young children. The homemakers whose husbands fell in the elementary group selected beef stew more often (Appendix Table 8).

### **Regular Inexpensive Meal**

For an inexpensive meat to serve at a regular evening meal, race seemed to have little influence on beef or pork choices when all cuts were grouped together. The percentage of the respondents who listed ground beef increased slightly as the family income increased. As the income increased, the selection of beef stew decreased.

The occupation of the husband seemed to make little difference in the kind of meat suggested for this situation. According to level-of-living scores, ground beef was suggested more often by those respondents who fell into Group IV and less often by Group I than those in the other groups. Beef stew was reported often by Groups I and II.

The higher the educational level of the homemaker became, the higher was the percentage who suggested ground beef for an inexpensive meal. The percentage of homemakers who mentioned beef stew and pork cuts decreased as the educational level increased. Poultry was suggested more frequently by those whose husbands had high school training (20 percent) than by those in the college or elementary groups. As the husbands' educational levels increased, the respondents' mentions of beef stew decreased (Appendix Table 9).



## Methods of Preparation for Meats Suggested for Various Meal Situations

Preparation influences the flavor, tenderness and texture of beef cuts. Consumer satisfaction is dependent, to some extent, upon the method of preparation. The method of preparation is sometimes influenced by the status of the meal. In this study consumers were asked to suggest the kind of meat preparation for various meal situations.

Of the total methods listed for preparing all kinds of meat, 78 percent of the respondents suggested a dry heat method—broiling, sautéing, frying, barbecuing, charcoal broiling or roasting. Almost 22 percent indicated their preference for cooking meat by a moist heat method which, for this study, included boiling, pot roasting, braising, swissing, stewing, creaming and pressure cooking.

To thoroughly examine the preparation of meat, methods of preparation were considered from the standpoint of the cut of the meat. Both kind of meat and cut of meat determine the method of preparation. Beef was divided into tender and less tender cuts according to generally accepted criteria.<sup>1</sup> Included as tender cuts were loin steaks, loin roasts and ground beef. Grouped as less tender cuts were round steaks, chuck steaks, round or rump roasts, chuck roasts and stew.

Of the total respondents who suggested tender cuts of beef for any meal situation, 89 percent indicated they would cook them by dry heat methods. Almost 11 percent of the respondents listed moist heat methods for preparing the tender cuts. This may imply that many respondents understood that tender cuts of beef may be successfully cooked by dry heat.

Sixty-nine percent of the respondents indicated moist heat for the preparation of the less tender cuts of beef, while 31 percent suggested dry heat methods. This may indicate that dry heat methods of preparing beef are more appealing to consumers even though tenderness may be sacrificed or that there is lack of information concerning the preparation of attractive and appetizing beef dishes by moist heat methods.

A larger percentage of the respondents suggested preparing poultry by dry heat (92 percent) than by moist heat methods (8 percent). More respondents suggested dry heat methods for poultry than for any other meat. Eighty-six percent reported dry heat methods for the preparation of pork, while 14 percent chose to cook pork with moist heat.

Of the total respondents who listed veal, 71 percent suggested cooking it by dry heat and 29 percent suggested moist heat. Dry heat was the most popular method of preparing seafood (86 percent). Fourteen percent suggested moist heat methods. Eighty-one percent of the 31 respondents who listed lamb suggested a dry heat method. Nineteen percent suggested cooking lamb with moist heat (Fig. 3).

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<sup>1</sup>Belle Lowe. *Experimental Cookery*. New York: London: John Wiley and Sons, Inc. 1955. P. 232.

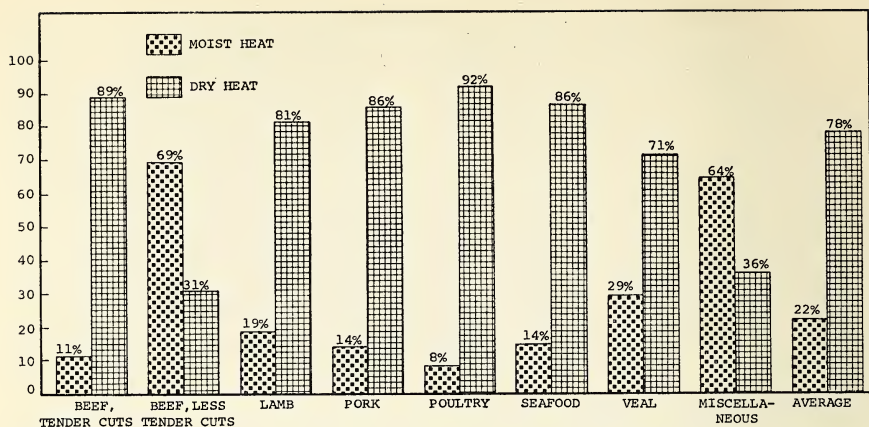


Fig. 3.—A Comparison of Suggestions of Moist and Dry Heat Methods for Preparing Meats for All Meal Situations.

### The Influence of Status of Meals on Meat Preparation

To determine the effect of the status of meals on meat preparation, three meals having high status and three meals with low status were evaluated. High status meal situations for this study included those planned for (1) an important man guest, (2) a special woman guest and (3) a couple to be impressed. Classified as low status meals were those planned for (1) a large family with several young children, (2) a busy day meal and (3) a regular inexpensive evening meal. A meal for Sunday dinner was not included under either high or low status groups.

Status of meals did not seem to influence greatly the method of cooking tender cuts of beef. For high status meats, almost 92 percent listed a dry heat method for tender cuts; and for low status meals, almost 88 percent suggested dry heat. The percentage suggesting moist heat for cooking tender cuts was low for both high status and low status meals.

The method of cooking less tender cuts of beef seems to have been affected by the status of the meal situation. Forty-five percent of the

TABLE 5.—Meat Preparation—High Status vs. Low Status Meals

| Kind of meat           | Method of preparation |    |            |    |             |    |            |    |
|------------------------|-----------------------|----|------------|----|-------------|----|------------|----|
|                        | Moist heat            |    |            |    | Dry heat    |    |            |    |
|                        | High status           |    | Low status |    | High status |    | Low status |    |
|                        | No.                   | %  | No.        | %  | No.         | %  | No.        | %  |
| Beef, tender cuts      | 56                    | 9  | 70         | 13 | 602         | 92 | 488        | 88 |
| Beef, less tender cuts | 207                   | 55 | 248        | 86 | 170         | 45 | 41         | 14 |
| Lamb                   | 2                     | 8  | 1          | 25 | 22          | 92 | 3          | 75 |
| Pork                   | 24                    | 14 | 22         | 10 | 151         | 86 | 194        | 90 |
| Poultry                | 37                    | 9  | 29         | 12 | 370         | 91 | 223        | 89 |
| Seafood                | 14                    | 16 | 3          | 10 | 74          | 84 | 27         | 90 |
| Veal                   | 21                    | 26 | 26         | 27 | 61          | 74 | 70         | 73 |
| Miscellaneous          | 13                    | 42 | 56         | 54 | 18          | 58 | 47         | 46 |

respondents suggesting less tender cuts indicated the dry heat method for high status meals. Only 14 percent suggested preparing less tender cuts by the dry heat method for low status meals. This may imply that respondents attempted to use dry heat methods of preparation for less tender cuts of beef in high status meal situations even though the eating qualities may not have been entirely satisfactory (Table 5).

### **Influence of Education of the Homemaker on Suggested Preparation of Meats**

When the suggested cooking methods were examined more critically to see if the education of the respondents affected the method of preparation, several differences were discovered. The level of education of the homemaker was combined into three groups: (1) those who had no education or had only elementary education, (2) those who had some high school training or were high school graduates and (3) those who had college training, graduate work, or nursing, business and trade schooling.

**Tender Cuts of Beef**—As the method of preparing tender cuts of beef, the percentage of respondents suggesting broiling increased as the level of education increased (55, 73 and 86 percent by groups). Frying was suggested more often by the elementary education group (19 percent) than by the respondents with high school training (9 percent) or those with college education (3 percent).

The methods of preparation were grouped into four broad categories for generalizations. These were (1) cooking with added moisture (braising, pot roasting, swissing, boiling, stewing, hashing, pressure cooking and soup making), (2) cooking without liquid (broiling, roasting and barbecuing), (3) cooking in fat (frying, sautéing and deep fat frying) and (4) miscellaneous (ready cooked, pizza, stuffed, creamed and other). As education increased, the percentage of respondents who suggested cooking tender cuts of beef without liquid increased. As education increased, those who reported cooking these cuts in fat decreased from 19 to 9 to 3 percent.

**Less Tender Cuts of Beef**—Pot roasting was suggested by almost one-third of each group for preparing less tender cuts of beef. As education increased, the percentage of respondents who suggested roasting or baking increased and those suggesting swissing decreased. When cooking methods were grouped, those who suggested cooking with added moisture decreased as education increased. The percentage of respondents who mentioned cooking the less tender cuts of beef without liquid increased as the education increased.

**Ground Beef**—The methods most often indicated for ground beef were broiling, frying and roasting or baking. The percentage of homemakers with little education who suggested broiling ground beef was low (2 percent); there was a large increase (25 percent) among those with high school training, but a smaller increase (15 percent) among the respondents with a college education. More respondents in the elemen-



tary group mentioned cooking in fat as a method of preparing ground beef than any other group. A greater percentage of respondents of the high school and college education levels listed cooking ground beef without liquid (60 and 49 percent) than did the elementary group (37 percent).

**Pork**—As a method of preparing pork, about one-third of both the homemakers with elementary education and those with high school training suggested frying, roasting or baking ground beef. The respondents in the college education group listed frying slightly less (26 percent) and roasting or baking more (43 percent).

**Poultry**—In all educational levels, the most popular method suggested for preparing poultry was frying. Each group of homemakers reported this method more than twice as often as other methods. Fifty-nine percent of the homemakers in the lowest education group suggested frying poultry, as compared with 63 percent of the high school group and 50 percent of the advanced education group. Education seemed to make little difference in frequency of suggestions for roasting or baking poultry; about one-fourth of each group suggested this method. Broiling was mentioned by 12 percent of the college trained homemakers, as compared with 3 percent of the high school and 2 percent of the elementary group. When methods were grouped, respondents with elementary and high school training listed cooking poultry without liquid less than did the advanced education group.

**Seafood and Veal**—As a way to cook seafood and veal, frying was mentioned more than any other method. About one-half of each group reported frying, but the percentage decreased as the educational level increased. Broiling veal was suggested by a smaller percentage of each group but increased as the educational level increased. For seafood, broiling suggestions also increased with the educational level from 0 to 5 to 19 percent.

In grouping methods for seafood, the respondents of the elementary and high school levels suggested cooking in fat more often than did the homemakers of the college level. Cooking seafood without liquid was the method of preparation indicated most often by the college group (32 percent); 10 percent of the high school group and 6 percent of the elementary group suggested this method. Thirty-six percent of the homemakers in the elementary group who listed veal suggested cooking it with added moisture. One-half as many in the high school group and about two-thirds as many in the college group reported this method.

Broiling was the method of cooking most affected by the education of the homemaker. The amount of broiling definitely increased as the educational level of the respondents increased. The percentage of respondents who listed swissing as a method of preparing all kinds of meat consistently decreased as the level of education increased. Overall, suggestions for cooking with added moisture decreased as the education of the homemaker increased. The opposite was true with preparing meats without liquid (Appendix Tables 1 & 2, pages 22 and 23).



## Appendix

### FORM 1.—QUESTIONS FROM WHICH DATA WERE OBTAINED

Now, we would like you to tell us what meats you think some homemakers would serve in various situations. After I read you the kind of meal each homemaker was planning, tell me what kind and cut of meat you think she decided to serve and how she cooked it.

Fred and Carol were having an important man guest for supper. What kind of meat do you think Carol would choose?

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

Ellen has a large family with several young children. She wants a main dish that the whole family will enjoy. What kind of meat do you think she would choose?

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

Barbara and her husband have invited a special woman guest for dinner. What kind of meat would she serve?

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

Dorothy is going to be busy all day. For the main meal she wants a cut of meat that won't take too long to prepare and will be easy.

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

Alice is planning the regular evening meal and needs something not too expensive.

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

What kind of meat would Anne cook for dinner on Sunday for her family?

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

Helen and her husband are having a couple over for supper. Helen wants something to impress them. What kind of meat will she serve?

Kind of meat \_\_\_\_\_ Cut \_\_\_\_\_

Method of cooking \_\_\_\_\_

**APPENDIX TABLE 1.—Influence of the Educational Level of the Homemaker  
on Detailed Methods of Meat Preparation**

| Method of preparation                                              | Kinds of meat           |                                 |                     |              |              |              |              |              |
|--------------------------------------------------------------------|-------------------------|---------------------------------|---------------------|--------------|--------------|--------------|--------------|--------------|
|                                                                    | Beef,<br>tender<br>cuts | Beef,<br>less<br>tender<br>cuts | Beef,<br>ground     | Lamb         | Pork         | Poultry      | Seafood      | Veal         |
| <b>Elementary (155)</b>                                            |                         |                                 |                     |              |              |              |              |              |
|                                                                    |                         |                                 | — — — Percent — — — |              |              |              |              |              |
| Broil                                                              | 41.6                    | 2.4                             | 2.1                 | 50.0         | 2.5          | 1.9          | 0.0          | 15.6         |
| Sauté, fry                                                         | 18.2                    | 6.3                             | 51.8                | 0.0          | 35.8         | 58.6         | 59.6         | 42.2         |
| Roast, bake                                                        | 9.1                     | 9.8                             | 34.7                | 50.0         | 30.8         | 24.7         | 5.8          | 6.7          |
| Pot roast                                                          | 7.1                     | 29.3                            | 0.0                 | 0.0          | 6.9          | 3.0          | 0.0          | 4.4          |
| Boil                                                               | 3.9                     | 0.0                             | 0.0                 | 0.0          | 7.5          | 0.8          | 5.8          | 0.0          |
| Stew, soup                                                         | 3.2                     | 24.4                            | 1.6                 | 0.0          | 1.3          | 2.3          | 1.9          | 8.9          |
| Barbecue                                                           | 3.2                     | 0.5                             | 0.5                 | 0.0          | 5.0          | 1.5          | 0.0          | 0.0          |
| Swiss                                                              | 2.6                     | 18.5                            | 2.1                 | 0.0          | 1.3          | 2.7          | 0.0          | 20.0         |
| Braise                                                             | 1.3                     | 3.4                             | 0.5                 | 0.0          | 2.5          | 0.4          | 0.0          | 2.2          |
| Deep fat fry                                                       | 0.6                     | 1.0                             | 0.0                 | 0.0          | 0.6          | 1.5          | 9.6          | 0.0          |
| *Miscellaneous                                                     | 7.1                     | 2.5                             | 4.7                 | 0.0          | 3.2          | 2.3          | 15.4         | 0.0          |
| Not indicated                                                      | 1.9                     | 2.0                             | 0.0                 | 0.0          | 2.5          | 0.4          | 1.9          | 0.0          |
| <b>TOTALS</b>                                                      | <b>99.8</b>             | <b>100.1</b>                    | <b>98.0</b>         | <b>100.0</b> | <b>99.9</b>  | <b>100.1</b> | <b>100.0</b> | <b>100.0</b> |
| <b>High School (287)</b>                                           |                         |                                 |                     |              |              |              |              |              |
| Broil                                                              | 60.2                    | 6.7                             | 24.8                | 26.7         | 9.3          | 2.8          | 4.8          | 18.0         |
| Pot roast                                                          | 10.8                    | 34.5                            | 1.2                 | 13.3         | 4.5          | 1.4          | 1.6          | 9.0          |
| Roast, bake                                                        | 9.9                     | 14.4                            | 34.9                | 46.7         | 35.2         | 20.6         | 4.8          | 5.6          |
| Sauté, fry                                                         | 8.4                     | 12.9                            | 32.7                | 13.3         | 38.9         | 62.8         | 54.0         | 55.1         |
| Boil                                                               | 2.7                     | 0.2                             | 0.0                 | 0.0          | 0.8          | 1.2          | 4.8          | 0.0          |
| Swiss                                                              | 2.7                     | 10.1                            | 0.9                 | 0.0          | 2.0          | 1.6          | 0.0          | 4.5          |
| Barbecue                                                           | 2.4                     | 0.2                             | 0.0                 | 0.0          | 2.8          | 3.3          | 0.0          | 0.0          |
| Braise                                                             | 0.5                     | 1.9                             | 0.3                 | 0.0          | 2.0          | 0.5          | 0.0          | 3.4          |
| Stew, soup                                                         | 0.5                     | 15.6                            | 0.3                 | 0.0          | 0.0          | 0.5          | 0.0          | 1.1          |
| Deep fat fry                                                       | 0.2                     | 0.0                             | 0.3                 | 0.0          | 0.0          | 2.1          | 14.3         | 0.0          |
| *Miscellaneous                                                     | 1.2                     | 2.4                             | 4.5                 | 0.0          | 3.2          | 2.5          | 12.7         | 3.4          |
| Not indicated                                                      | 0.5                     | 0.7                             | 0.0                 | 0.0          | 1.2          | 0.7          | 3.2          | 0.0          |
| <b>TOTALS</b>                                                      | <b>100.0</b>            | <b>99.6</b>                     | <b>99.9</b>         | <b>100.0</b> | <b>99.9</b>  | <b>100.0</b> | <b>100.2</b> | <b>100.1</b> |
| <b>College, Graduate School, Nursing, Business and Trade (139)</b> |                         |                                 |                     |              |              |              |              |              |
| Broil                                                              | 70.7                    | 6.9                             | 14.7                | 41.7         | 11.6         | 11.5         | 19.4         | 23.4         |
| Roast, bake                                                        | 12.4                    | 30.9                            | 32.2                | 25.0         | 43.2         | 24.5         | 11.1         | 2.1          |
| Pot roast                                                          | 8.9                     | 29.7                            | 0.0                 | 0.0          | 5.3          | 2.0          | 2.8          | 8.5          |
| Sauté, fry                                                         | 3.1                     | 8.6                             | 42.0                | 0.0          | 26.3         | 50.0         | 22.2         | 46.8         |
| Barbecue                                                           | 1.9                     | 0.0                             | 1.4                 | 0.0          | 4.0          | 1.5          | 0.0          | 0.0          |
| Boil                                                               | 1.2                     | 0.6                             | 0.0                 | 8.3          | 4.2          | 2.5          | 8.3          | 0.0          |
| Swiss                                                              | 0.8                     | 4.0                             | 2.8                 | 0.0          | 1.1          | 2.5          | 0.0          | 4.3          |
| Braise                                                             | 0.0                     | 2.9                             | 0.0                 | 0.0          | 1.1          | 0.0          | 2.8          | 10.6         |
| Stew, soup                                                         | 0.0                     | 12.0                            | 0.7                 | 0.0          | 0.0          | 1.5          | 0.0          | 2.1          |
| Deep fat fry                                                       | 0.0                     | 0.0                             | 0.0                 | 0.0          | 0.0          | 1.5          | 5.6          | 0.0          |
| *Miscellaneous                                                     | 2.3                     | 2.3                             | 5.6                 | 25.0         | 4.0          | 2.0          | 22.3         | 2.1          |
| Not indicated                                                      | 0.8                     | 2.3                             | 0.7                 | 0.0          | 1.1          | 0.5          | 5.6          | 0.0          |
| <b>TOTALS</b>                                                      | <b>100.2</b>            | <b>100.2</b>                    | <b>100.1</b>        | <b>100.0</b> | <b>101.9</b> | <b>100.0</b> | <b>100.1</b> | <b>99.9</b>  |

\*Miscellaneous includes ready cooked, pizza, stuffed, creamed and others.

**APPENDIX TABLE 2.—Influence of the Educational Level of the Homemaker  
on Broad Methods of Meat Preparation**

|                             | Kinds of meat       |                        |              |       |       |         |         |       |
|-----------------------------|---------------------|------------------------|--------------|-------|-------|---------|---------|-------|
| Method of preparation       | Beef, tender cuts   | Beef, less tender cuts | Beef, ground | Lamb  | Pork  | Poultry | Seafood | Veal  |
|                             | — — — Percent — — — |                        |              |       |       |         |         |       |
| Elementary                  |                     |                        |              |       |       |         |         |       |
| Cooking with added moisture | 18.5                | 77.6                   | 5.2          | 0.0   | 20.0  | 9.2     | 7.8     | 35.6  |
| Cooking without liquid      | 55.0                | 12.9                   | 37.3         | 100.0 | 39.4  | 28.2    | 5.9     | 22.2  |
| Cooking in fat              | 19.2                | 7.5                    | 53.9         | 0.0   | 37.4  | 60.3    | 70.6    | 42.2  |
| Miscellaneous               | 7.3                 | 2.0                    | 3.6          | 0.0   | 3.2   | 2.3     | 15.7    | 0.0   |
| TOTAL                       | 100.0               | 100.0                  | 100.0        | 100.0 | 100.0 | 100.0   | 100.0   | 100.0 |
| High School                 |                     |                        |              |       |       |         |         |       |
| Cooking with added moisture | 17.2                | 63.0                   | 4.0          | 15.2  | 9.8   | 5.2     | 6.6     | 18.0  |
| Cooking without liquid      | 72.9                | 21.5                   | 59.6         | 73.3  | 48.0  | 26.9    | 9.8     | 23.6  |
| Cooking in fat              | 8.7                 | 13.0                   | 33.3         | 13.3  | 39.3  | 65.3    | 70.5    | 55.1  |
| Miscellaneous               | 1.2                 | 2.4                    | 3.4          | 0.0   | 2.9   | 2.6     | 13.1    | 3.4   |
| TOTAL                       | 100.0               | 99.9                   | 100.0        | 99.9  | 100.0 | 100.0   | 100.0   | 100.1 |
| College                     |                     |                        |              |       |       |         |         |       |
| Cooking with added moisture | 10.9                | 50.3                   | 3.5          | 8.3   | 11.7  | 8.5     | 14.7    | 25.5  |
| Cooking without liquid      | 85.6                | 38.6                   | 48.6         | 66.7  | 58.5  | 37.7    | 32.4    | 25.5  |
| Cooking in fat              | 3.1                 | 8.8                    | 42.3         | 0.0   | 26.6  | 51.8    | 29.4    | 46.8  |
| Miscellaneous               | 0.4                 | 2.3                    | 5.6          | 25.0  | 3.2   | 2.0     | 23.5    | 2.1   |
| TOTAL                       | 100.0               | 100.0                  | 100.0        | 100.0 | 100.0 | 100.0   | 100.0   | 99.9  |

APPENDIX TABLE 3.—Influence of Demographic Factors on Cuts of Meat Suggested to Serve an Important Man Guest

| Cut of meat               | Race           |                   | Family income |                 |              | Occupation of husband   |                 |                  |                       |                            | Percent | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) | Profes-<br>sional<br>(153) |
|---------------------------|----------------|-------------------|---------------|-----------------|--------------|-------------------------|-----------------|------------------|-----------------------|----------------------------|---------|-------------------------|-----------------|------------------|-----------------------|----------------------------|
|                           | White<br>(427) | Nonwhite<br>(161) | Low<br>(278)  | Medium<br>(208) | High<br>(99) | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) | Profes-<br>sional<br>(153) |         |                         |                 |                  |                       |                            |
|                           |                |                   |               |                 |              |                         |                 |                  |                       |                            |         |                         |                 |                  |                       |                            |
| Beef, loin steak          | 56             | 26                | 31            | 61              | 68           | 31                      | 26              | 43               | 49                    | 67                         | 31      | 26                      | 43              | 49               | 67                    |                            |
| Beef, round or rump roast | 8              | 6                 | 8             | 8               | 6            | 14                      | 10              | 8                | 13                    | 5                          | 14      | 10                      | 8               | 13               | 5                     |                            |
| Beef, loin roast          | 8              | 5                 | 6             | 6               | 14           | 6                       | 3               | 9                | 5                     | 11                         | 6       | 3                       | 9               | 5                | 11                    |                            |
| Beef, round steak         | 6              | 11                | 12            | 4               | 1            | 6                       | 19              | 9                | 3                     | 3                          | 6       | 19                      | 9               | 3                | 3                     |                            |
| Poultry, all types        | 5              | 25                | 16            | 7               | 2            | 17                      | 17              | 13               | 5                     | 5                          | 17      | 17                      | 13              | 5                | 5                     |                            |
| Beef, chuck roast         | 4              | 3                 | 4             | 3               | 3            | 4                       | 6               | 2                | 10                    | 1                          | 4       | 6                       | 2               | 10               | 1                     |                            |
| Veal, chops and steak     | 3              | 4                 | 3             | 5               | 0            | 4                       | 6               | 5                | 0                     | 3                          | 4       | 6                       | 5               | 0                | 3                     |                            |
| Pork, ham                 | 2              | 4                 | 4             | 2               | 2            | 4                       | 1               | 2                | 3                     | 2                          | 4       | 1                       | 2               | 3                | 2                     |                            |
| Beef, other               | 2              | 1                 | 2             | 2               | 2            | 0                       | 1               | 1                | 3                     | 1                          | 0       | 1                       | 1               | 3                | 1                     |                            |
| Beef, ground              | 2              | 1                 | 1             | 1               | 0            | 0                       | 1               | 1                | 3                     | 1                          | 0       | 1                       | 1               | 3                | 1                     |                            |
| Seafood, all types        | 1              | 3                 | 3             | 0               | 1            | 0                       | 3               | 3                | 3                     | 1                          | 0       | 3                       | 3               | 3                | 1                     |                            |
| Pork, chops and steak     | 1              | 6                 | 5             | 0               | 0            | 6                       | 4               | 0                | 3                     | 0                          | 6       | 4                       | 0               | 3                | 0                     |                            |
| Pork, roast               | 1              | 3                 | 2             | 1               | 0            | 4                       | 3               | 1                | 0                     | 1                          | 4       | 3                       | 1               | 0                | 1                     |                            |
| Lamb, all types           | 1              | 1                 | 1             | 1               | 1            | 2                       | 0               | 1                | 3                     | 0                          | 2       | 0                       | 1               | 3                | 0                     |                            |
| Veal, roast and other     | 0              | 0                 | 0             | 0               | 0            | 0                       | 0               | 1                | 0                     | 0                          | 0       | 0                       | 1               | 0                | 0                     |                            |
| Beef, stew                | 0              | 0                 | 0             | 0               | 0            | 0                       | 0               | 0                | 0                     | 0                          | 0       | 0                       | 0               | 0                | 0                     |                            |
| Pork, other               | 0              | 1                 | 1             | 0               | 0            | 0                       | 0               | 1                | 0                     | 0                          | 0       | 0                       | 1               | 0                | 0                     |                            |
| Miscellaneous             | 0              | 0                 | 0             | 0               | 0            | 0                       | 0               | 0                | 0                     | 0                          | 0       | 0                       | 0               | 0                | 0                     |                            |
| No answer                 | 1              | 1                 | 1             | 0               | 0            | 4                       | 0               | 0                | 0                     | 0                          | 4       | 0                       | 0               | 0                | 0                     |                            |
| Total                     | 101            | 101               | 100           | 101             | 100          | 102                     | 100             | 100              | 103                   | 101                        | 102     | 100                     | 100             | 103              | 101                   |                            |

(Continued)



APPENDIX TABLE 3.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              |               | Education of homemaker |                          |                         |                  | Education of husband     |                         |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|---------------|------------------------|--------------------------|-------------------------|------------------|--------------------------|-------------------------|------------------|
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37) | Percent                | Elemen-<br>tary<br>(155) | High<br>school<br>(287) | College<br>(139) | Elemen-<br>tary<br>(151) | High<br>school<br>(185) | College<br>(142) |
|                           | 32                    | 36           | 64           | 67           | 54            |                        | 31                       | 49                      | 63               | 29                       | 50                      | 63               |
| Beef, loin steak          | 8                     | 9            | 6            | 8            | 8             |                        | 6                        | 8                       | 8                | 11                       | 9                       | 5                |
| Beef, round or rump roast | 3                     | 5            | 7            | 11           | 22            |                        | 2                        | 7                       | 13               | 3                        | 9                       | 12               |
| Beef, loin roast          | 10                    | 11           | 3            | 2            | 11            |                        | 9                        | 9                       | 1                | 13                       | 7                       | 3                |
| Beef, round steak         | 20                    | 14           | 6            | 5            | 0             |                        | 19                       | 11                      | 4                | 20                       | 9                       | 2                |
| Poultry, all types        | 3                     | 5            | 3            | 0            | 0             |                        | 1                        | 5                       | 1                | 2                        | 5                       | 4                |
| Beef, chuck roast         | 0                     | 5            | 4            | 0            | 3             |                        | 6                        | 2                       | 3                | 5                        | 3                       | 3                |
| Veal, chops and steak     | 6                     | 3            | 2            | 3            | 0             |                        | 5                        | 2                       | 1                | 3                        | 1                       | 4                |
| Pork, ham                 | 3                     | 2            | 1            | 2            | 3             |                        | 2                        | 2                       | 1                | 1                        | 2                       | 1                |
| Beef, other               | 0                     | 1            | 1            | 5            | 0             |                        | 2                        | 1                       | 1                | 2                        | 1                       | 1                |
| Beef, ground              | 2                     | 3            | 1            | 0            | 0             |                        | 3                        | 1                       | 1                | 3                        | 2                       | 1                |
| Seafood, all types        | 5                     | 4            | 0            | 0            | 0             |                        | 8                        | 0                       | 0                | 3                        | 1                       | 0                |
| Pork, chops and steak     | 2                     | 2            | 1            | 0            | 0             |                        | 3                        | 1                       | 1                | 3                        | 1                       | 1                |
| Pork, roast               | 1                     | 0            | 1            | 0            | 0             |                        | 1                        | 0                       | 1                | 1                        | 0                       | 1                |
| Lamb, all types           | 0                     | 0            | 1            | 0            | 0             |                        | 0                        | 0                       | 0                | 0                        | 0                       | 0                |
| Veal, roast and other     | 0                     | 0            | 0            | 0            | 0             |                        | 0                        | 0                       | 0                | 0                        | 0                       | 0                |
| Beef, stew                | 2                     | 0            | 0            | 0            | 0             |                        | 1                        | 0                       | 0                | 1                        | 0                       | 0                |
| Pork, other               | 0                     | 0            | 0            | 0            | 0             |                        | 0                        | 0                       | 0                | 0                        | 0                       | 0                |
| Miscellaneous             | 2                     | 0            | 0            | 0            | 0             |                        | 1                        | 1                       | 0                | 1                        | 1                       | 0                |
| No answer                 | 99                    | 100          | 101          | 103          | 101           |                        | 100                      | 99                      | 99               | 101                      | 101                     | 101              |
| Total                     |                       |              |              |              |               |                        |                          |                         |                  |                          |                         |                  |

APPENDIX TABLE 4.—Influence of Demographic Factors on Cuts of Meat Suggested to Serve a Special Woman Guest

| Cut of meat               | Race           |                   | Family income |                 |              | Occupation of husband   |                 |                  |                       | Profes-<br>sional<br>(153) |
|---------------------------|----------------|-------------------|---------------|-----------------|--------------|-------------------------|-----------------|------------------|-----------------------|----------------------------|
|                           | White<br>(427) | Nonwhite<br>(161) | Low<br>(278)  | Medium<br>(208) | High<br>(99) | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) |                            |
|                           |                |                   |               |                 |              |                         |                 |                  |                       | Percent                    |
| Beef, loin steak          | 15             | 6                 | 9             | 14              | 16           | 10                      | 10              | 12               | 13                    | 12                         |
| Beef, round or rump roast | 4              | 6                 | 5             | 3               | 2            | 10                      | 3               | 5                | 0                     | 3                          |
| Beef, loin roast          | 4              | 1                 | 1             | 3               | 8            | 0                       | 1               | 3                | 3                     | 5                          |
| Beef, round steak         | 4              | 9                 | 8             | 4               | 3            | 4                       | 14              | 7                | 0                     | 5                          |
| Poultry, all types        | 38             | 45                | 40            | 42              | 41           | 43                      | 46              | 37               | 40                    | 40                         |
| Beef, chuck roast         | 2              | 0                 | 1             | 1               | 3            | 2                       | 0               | 3                | 5                     | 0                          |
| Veal, chops and steak     | 7              | 3                 | 6             | 6               | 4            | 4                       | 6               | 6                | 8                     | 6                          |
| Pork, ham                 | 5              | 3                 | 2             | 7               | 6            | 4                       | 3               | 4                | 5                     | 6                          |
| Beef, other               | 1              | 2                 | 1             | 3               | 2            | 2                       | 3               | 1                | 0                     | 3                          |
| Beef, ground              | 3              | 4                 | 3             | 3               | 2            | 2                       | 1               | 5                | 5                     | 1                          |
| Seafood, all types        | 6              | 8                 | 8             | 4               | 8            | 6                       | 7               | 5                | 10                    | 7                          |
| Pork, chops and steak     | 5              | 8                 | 7             | 5               | 1            | 2                       | 11              | 7                | 3                     | 5                          |
| Pork, roast               | 1              | 3                 | 2             | 1               | 0            | 2                       | 0               | 2                | 0                     | 0                          |
| Lamb, all types           | 3              | 0                 | 1             | 3               | 1            | 2                       | 0               | 1                | 0                     | 5                          |
| Veal, roast and other     | 2              | 2                 | 2             | 1               | 1            | 2                       | 1               | 2                | 3                     | 0                          |
| Beef, stew                | 1              | 0                 | 0             | 1               | 0            | 2                       | 0               | 1                | 0                     | 0                          |
| Pork, other               | 0              | 1                 | 1             | 0               | 0            | 4                       | 0               | 0                | 0                     | 0                          |
| Miscellaneous             | 0              | 0                 | 0             | 0               | 0            | 0                       | 0               | 0                | 0                     | 0                          |
| No answer                 | 1              | 2                 | 1             | 0               | 1            | 4                       | 0               | 1                | 0                     | 0                          |
| Total                     | 102            | 103               | 98            | 101             | 99           | 102                     | 100             | 102              | 101                   | 101                        |

(Continued)

APPENDIX TABLE 4.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              |               | Percent | Education of homemaker   |                         |                  | Education of husband     |                         |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|---------------|---------|--------------------------|-------------------------|------------------|--------------------------|-------------------------|------------------|
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37) |         | Elemen-<br>tary<br>(155) | High<br>school<br>(287) | College<br>(139) | Elemen-<br>tary<br>(151) | High<br>school<br>(185) | College<br>(142) |
|                           |                       |              |              |              |               |         |                          |                         |                  |                          |                         |                  |
| Beef, loin steak          | 7                     | 10           | 22           | 20           | 11            | 9       | 12                       | 14                      | 6                | 14                       | 13                      |                  |
| Beef, round or rump roast | 7                     | 4            | 3            | 5            | 3             | 7       | 3                        | 4                       | 3                | 4                        | 6                       |                  |
| Beef, loin roast          | 0                     | 1            | 6            | 6            | 3             | 1       | 4                        | 3                       | 1                | 5                        | 4                       |                  |
| Beef, round steak         | 9                     | 7            | 4            | 2            | 5             | 4       | 8                        | 4                       | 7                | 7                        | 4                       |                  |
| Poultry, all types        | 47                    | 41           | 35           | 32           | 46            | 43      | 40                       | 39                      | 46               | 36                       | 40                      |                  |
| Beef, chuck roast         | 2                     | 0            | 3            | 2            | 3             | 2       | 1                        | 1                       | 1                | 1                        | 2                       |                  |
| Veal, chops and steak     | 5                     | 5            | 6            | 8            | 3             | 4       | 6                        | 7                       | 8                | 6                        | 6                       |                  |
| Pork, ham                 | 2                     | 5            | 3            | 8            | 8             | 1       | 4                        | 10                      | 1                | 4                        | 10                      |                  |
| Beef, other               | 0                     | 1            | 0            | 2            | 0             | 2       | 1                        | 1                       | 3                | 2                        | 2                       |                  |
| Beef, ground              | 3                     | 3            | 3            | 2            | 3             | 5       | 3                        | 1                       | 3                | 5                        | 0                       |                  |
| Seafood, all types        | 2                     | 7            | 6            | 8            | 8             | 6       | 6                        | 8                       | 7                | 4                        | 9                       |                  |
| Pork, chops and steaks    | 5                     | 8            | 4            | 3            | 0             | 8       | 7                        | 1                       | 8                | 7                        | 2                       |                  |
| Pork, roast               | 5                     | 1            | 1            | 0            | 0             | 3       | 1                        | 0                       | 2                | 1                        | 0                       |                  |
| Lamb, all types           | 0                     | 2            | 1            | 5            | 5             | 1       | 2                        | 4                       | 1                | 2                        | 2                       |                  |
| Veal, roast and other     | 1                     | 1            | 2            | 0            | 0             | 2       | 1                        | 1                       | 2                | 2                        | 1                       |                  |
| Beef, stew                | 0                     | 1            | 0            | 0            | 0             | 1       | 0                        | 1                       | 1                | 1                        | 0                       |                  |
| Pork, other               | 1                     | 0            | 0            | 0            | 0             | 1       | 0                        | 0                       | 1                | 0                        | 1                       |                  |
| Miscellaneous             | 0                     | 0            | 0            | 0            | 0             | 0       | 0                        | 0                       | 0                | 0                        | 0                       |                  |
| No answer                 | 2                     | 1            | 0            | 2            | 0             | 1       | 1                        | 0                       | 2                | 1                        | 0                       |                  |
| Total                     | 98                    | 98           | 99           | 105          | 98            | 101     | 100                      | 99                      | 103              | 102                      | 102                     |                  |

APPENDIX TABLE 5.—Influence of Demographic Factors on Cuts of Meat Suggested to Impress a Couple

| Cut of meat               | Race        |                |  | Family income |              |           | Occupation of husband |              |               |               | Professional (153) |
|---------------------------|-------------|----------------|--|---------------|--------------|-----------|-----------------------|--------------|---------------|---------------|--------------------|
|                           | White (427) | Nonwhite (161) |  | Low (278)     | Medium (208) | High (99) | Unemployed (52)       | Service (72) | Skilled (151) | Clerical (39) |                    |
|                           |             |                |  |               |              |           | Percent               |              |               |               |                    |
| Beef, loin steak          | 38          | 16             |  | 21            | 37           | 54        | 41                    | 49           | 30            | 21            | 15                 |
| Beef, round or rump roast | 3           | 4              |  | 4             | 3            | 2         | 2                     | 5            | 6             | 3             | 2                  |
| Beef, loin roast          | 3           | 4              |  | 3             | 4            | 3         | 5                     | 3            | 2             | 1             | 4                  |
| Beef, round steak         | 6           | 5              |  | 7             | 6            | 1         | 4                     | 3            | 8             | 7             | 8                  |
| Poultry, all types        | 15          | 29             |  | 21            | 19           | 15        | 17                    | 13           | 17            | 24            | 25                 |
| Beef, chuck roast         | 1           | 1              |  | 2             | 1            | 1         | 1                     | 0            | 2             | 0             | 4                  |
| Veal, chops and steak     | 2           | 3              |  | 2             | 4            | 1         | 2                     | 0            | 3             | 7             | 2                  |
| Pork, ham                 | 8           | 11             |  | 10            | 9            | 5         | 7                     | 0            | 12            | 14            | 4                  |
| Beef, other               | 3           | 1              |  | 3             | 2            | 2         | 2                     | 8            | 2             | 0             | 8                  |
| Beef, ground              | 3           | 5              |  | 5             | 2            | 3         | 2                     | 0            | 5             | 1             | 4                  |
| Seafood, all types        | 10          | 13             |  | 13            | 9            | 7         | 12                    | 5            | 6             | 15            | 12                 |
| Pork, chops and steak     | 3           | 1              |  | 1             | 3            | 1         | 3                     | 3            | 3             | 0             | 0                  |
| Pork, roast               | 1           | 2              |  | 2             | 1            | 0         | 1                     | 0            | 1             | 1             | 0                  |
| Lamb, all types           | 1           | 2              |  | 2             | 1            | 1         | 1                     | 3            | 1             | 0             | 4                  |
| Veal, roast and other     | 0           | 0              |  | 0             | 0            | 0         | 0                     | 0            | 0             | 0             | 0                  |
| Beef, stew                | 1           | 0              |  | 0             | 0            | 1         | 1                     | 0            | 0             | 0             | 2                  |
| Pork, other               | 1           | 3              |  | 3             | 1            | 0         | 0                     | 8            | 2             | 6             | 4                  |
| Miscellaneous             | 1           | 1              |  | 0             | 0            | 3         | 1                     | 3            | 1             | 0             | 0                  |
| No answer                 | 1           | 1              |  | 1             | 0            | 0         | 0                     | 0            | 0             | 0             | 4                  |
| Total                     | 101         | 102            |  | 100           | 102          | 100       | 102                   | 103          | 101           | 100           | 102                |

(Continued)



APPENDIX TABLE 5.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              |               | Percent | Education of homemaker |                      |                  | Education of husband |                      |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|---------------|---------|------------------------|----------------------|------------------|----------------------|----------------------|------------------|
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37) |         | Elementary<br>(155)    | High school<br>(287) | College<br>(139) | Elementary<br>(151)  | High school<br>(185) | College<br>(142) |
|                           |                       |              |              |              |               |         |                        |                      |                  |                      |                      |                  |
| Beef, loin steak          | 14                    | 26           | 40           | 49           | 54            | 18      | 35                     | 43                   | 16               | 33                   | 48                   |                  |
| Beef, round or rump roast | 5                     | 4            | 2            | 5            | 0             | 2       | 4                      | 4                    | 4                | 5                    | 0                    |                  |
| Beef, loin roast          | 1                     | 4            | 1            | 6            | 8             | 5       | 2                      | 4                    | 3                | 4                    | 4                    |                  |
| Beef, round steak         | 6                     | 8            | 5            | 0            | 3             | 8       | 6                      | 2                    | 11               | 5                    | 4                    |                  |
| Poultry, all types        | 27                    | 19           | 17           | 14           | 16            | 23      | 17                     | 19                   | 22               | 19                   | 13                   |                  |
| Beef, chuck roast         | 0                     | 2            | 1            | 0            | 0             | 1       | 2                      | 1                    | 2                | 1                    | 2                    |                  |
| Veal, chops and steak     | 1                     | 3            | 5            | 0            | 0             | 1       | 3                      | 2                    | 4                | 2                    | 2                    |                  |
| Pork, ham                 | 12                    | 9            | 10           | 5            | 0             | 11      | 10                     | 4                    | 11               | 10                   | 5                    |                  |
| Beef, other               | 1                     | 2            | 3            | 3            | 0             | 1       | 2                      | 3                    | 1                | 2                    | 4                    |                  |
| Beef, ground              | 10                    | 1            | 4            | 5            | 3             | 6       | 4                      | 1                    | 5                | 3                    | 2                    |                  |
| Seafood, all types        | 16                    | 12           | 7            | 8            | 8             | 15      | 8                      | 11                   | 14               | 8                    | 11                   |                  |
| Pork, chops and steak     | 1                     | 3            | 3            | 0            | 3             | 0       | 3                      | 2                    | 0                | 3                    | 3                    |                  |
| Pork, roast               | 1                     | 1            | 1            | 2            | 0             | 1       | 1                      | 1                    | 1                | 1                    | 1                    |                  |
| Lamb, all types           | 1                     | 2            | 0            | 3            | 3             | 2       | 1                      | 1                    | 1                | 2                    | 1                    |                  |
| Veal, roast and other     | 0                     | 0            | 0            | 0            | 0             | 0       | 0                      | 0                    | 0                | 0                    | 0                    |                  |
| Beef, stew                | 0                     | 0            | 0            | 2            | 0             | 1       | 0                      | 0                    | 1                | 0                    | 1                    |                  |
| Pork, other               | 2                     | 2            | 1            | 2            | 0             | 5       | 0                      | 1                    | 3                | 1                    | 1                    |                  |
| Miscellaneous             | 0                     | 0            | 1            | 0            | 3             | 0       | 0                      | 2                    | 0                | 1                    | 1                    |                  |
| No answer                 | 2                     | 0            | 0            | 0            | 0             | 1       | 0                      | 0                    | 1                | 1                    | 0                    |                  |
| Total                     | 100                   | 98           | 101          | 104          | 101           | 101     | 98                     | 101                  | 100              | 101                  | 103                  |                  |

APPENDIX TABLE 6.—Influence of Demographic Factors on Cuts of Meat Suggested for Sunday Dinner

| Cut of meat               | Race           |                   | Family income |                 |              | Occupation of husband |  |  |  | Percent | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) | Profes-<br>sional<br>(15%) |
|---------------------------|----------------|-------------------|---------------|-----------------|--------------|-----------------------|--|--|--|---------|-------------------------|-----------------|------------------|-----------------------|----------------------------|
|                           | White<br>(427) | Nonwhite<br>(161) | Low<br>(278)  | Medium<br>(208) | High<br>(99) |                       |  |  |  |         |                         |                 |                  |                       |                            |
| Beef, loin steak          | 2              | 1                 | 1             | 2               | 3            |                       |  |  |  |         | 0                       | 3               | 1                | 5                     | 2                          |
| Beef, round or rump roast | 16             | 8                 | 10            | 12              | 30           |                       |  |  |  |         | 15                      | 15              | 7                | 15                    | 20                         |
| Beef, loin roast          | 12             | 3                 | 5             | 14              | 14           |                       |  |  |  |         | 10                      | 4               | 7                | 10                    | 14                         |
| Beef, round steak         | 2              | 3                 | 3             | 2               | 1            |                       |  |  |  |         | 2                       | 3               | 3                | 5                     | 1                          |
| Poultry, all types        | 35             | 47                | 46            | 34              | 27           |                       |  |  |  |         | 40                      | 42              | 41               | 36                    | 33                         |
| Beef, chuck roast         | 8              | 6                 | 7             | 10              | 6            |                       |  |  |  |         | 6                       | 8               | 9                | 8                     | 7                          |
| Veal, chops and steak     | 1              | 0                 | 0             | 1               | 1            |                       |  |  |  |         | 0                       | 0               | 1                | 0                     | 1                          |
| Pork, ham                 | 11             | 8                 | 8             | 13              | 9            |                       |  |  |  |         | 6                       | 8               | 11               | 8                     | 11                         |
| Beef, other               | 4              | 1                 | 2             | 4               | 4            |                       |  |  |  |         | 0                       | 0               | 4                | 3                     | 4                          |
| Beef, ground              | 2              | 6                 | 4             | 2               | 3            |                       |  |  |  |         | 4                       | 4               | 3                | 3                     | 3                          |
| Seafood, all types        | 1              | 0                 | 1             | 1               | 0            |                       |  |  |  |         | 0                       | 0               | 1                | 3                     | 0                          |
| Pork, chops and steak     | 1              | 0                 | 0             | 1               | 0            |                       |  |  |  |         | 0                       | 1               | 0                | 3                     | 1                          |
| Pork, roast               | 2              | 9                 | 6             | 4               | 0            |                       |  |  |  |         | 2                       | 4               | 7                | 0                     | 3                          |
| Lamb, all types           | 0              | 1                 | 1             | 1               | 0            |                       |  |  |  |         | 0                       | 0               | 1                | 0                     | 0                          |
| Veal, roast and other     | 1              | 3                 | 3             | 1               | 1            |                       |  |  |  |         | 6                       | 4               | 1                | 0                     | 1                          |
| Beef, stew                | 1              | 2                 | 2             | 0               | 0            |                       |  |  |  |         | 6                       | 1               | 1                | 0                     | 0                          |
| Pork, other               | 1              | 1                 | 1             | 0               | 0            |                       |  |  |  |         | 0                       | 1               | 2                | 0                     | 0                          |
| Miscellaneous             | 0              | 0                 | 0             | 0               | 0            |                       |  |  |  |         | 0                       | 0               | 0                | 0                     | 0                          |
| No answer                 | 1              | 1                 | 1             | 1               | 0            |                       |  |  |  |         | 4                       | 0               | 0                | 3                     | 0                          |
| Total                     | 101            | 100               | 101           | 103             | 99           |                       |  |  |  |         | 101                     | 98              | 100              | 102                   | 101                        |

(Continued)

APPENDIX TABLE 6.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              | Education of homemaker |                     |                         |                  | Education of husband |                         |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|------------------------|---------------------|-------------------------|------------------|----------------------|-------------------------|------------------|
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37)          | Elementary<br>(155) | High<br>school<br>(287) | College<br>(139) | Elementary<br>(151)  | High<br>school<br>(185) | College<br>(142) |
|                           | Percent               |              |              |              |                        |                     |                         |                  |                      |                         |                  |
| Beef, loin steak          | 1                     | 1            | 4            | 0            | 3                      | 1                   | 1                       | 4                | 1                    | 0                       | 4                |
| Beef, round or rump roast | 5                     | 12           | 19           | 14           | 32                     | 10                  | 13                      | 22               | 11                   | 11                      | 23               |
| Beef, loin roast          | 6                     | 9            | 10           | 20           | 11                     | 6                   | 10                      | 13               | 5                    | 12                      | 11               |
| Beef, round steak         | 3                     | 2            | 2            | 2            | 0                      | 2                   | 3                       | 1                | 1                    | 3                       | 3                |
| Poultry, all types        | 41                    | 42           | 35           | 29           | 38                     | 46                  | 38                      | 31               | 44                   | 41                      | 27               |
| Beef, chuck roast         | 10                    | 7            | 7            | 6            | 8                      | 6                   | 8                       | 8                | 9                    | 7                       | 8                |
| Veal, chops and steak     | 0                     | 1            | 1            | 0            | 0                      | 0                   | 1                       | 1                | 0                    | 1                       | 1                |
| Pork, ham                 | 10                    | 9            | 8            | 17           | 8                      | 10                  | 10                      | 9                | 11                   | 8                       | 11               |
| Beef, other               | 2                     | 2            | 5            | 5            | 0                      | 1                   | 3                       | 5                | 0                    | 4                       | 4                |
| Beef, ground              | 6                     | 4            | 2            | 5            | 0                      | 7                   | 2                       | 2                | 3                    | 4                       | 3                |
| Seafood, all types        | 1                     | 0            | 1            | 0            | 0                      | 1                   | 1                       | 0                | 1                    | 1                       | 0                |
| Pork, chops and steak     | 0                     | 0            | 1            | 0            | 0                      | 0                   | 1                       | 1                | 0                    | 1                       | 1                |
| Pork, roast               | 3                     | 7            | 3            | 2            | 0                      | 6                   | 4                       | 2                | 6                    | 3                       | 3                |
| Lamb, all types           | 0                     | 1            | 0            | 0            | 0                      | 1                   | 1                       | 0                | 1                    | 1                       | 0                |
| Veal, roast and other     | 2                     | 2            | 2            | 2            | 0                      | 2                   | 2                       | 1                | 2                    | 2                       | 2                |
| Beef, stew                | 3                     | 1            | 0            | 0            | 0                      | 1                   | 1                       | 1                | 2                    | 1                       | 0                |
| Pork, other               | 1                     | 0            | 1            | 0            | 0                      | 1                   | 1                       | 0                | 1                    | 2                       | 0                |
| Miscellaneous             | 0                     | 0            | 0            | 0            | 0                      | 0                   | 0                       | 0                | 0                    | 0                       | 0                |
| No answer                 | 2                     | 0            | 0            | 2            | 0                      | 1                   | 1                       | 0                | 1                    | 1                       | 1                |
| Total                     | 99                    | 100          | 101          | 104          | 100                    | 102                 | 101                     | 101              | 99                   | 103                     | 102              |

APPENDIX TABLE 7.—Influence of Demographic Factors on Cuts of Meat Suggested for a Meal to be Served by a Busy Housewife

| Cut of meat               | Race           |                   | Family income |                 |              | Occupation of husband   |                 |                  |                       |         | Professional<br>(153) |
|---------------------------|----------------|-------------------|---------------|-----------------|--------------|-------------------------|-----------------|------------------|-----------------------|---------|-----------------------|
|                           | White<br>(427) | Nonwhite<br>(161) | Low<br>(278)  | Medium<br>(208) | High<br>(99) | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) |         |                       |
|                           |                |                   |               |                 |              |                         |                 |                  |                       | Percent |                       |
| Beef, loin steak          | 9              | 4                 | 6             | 7               | 17           | 4                       | 7               | 6                | 8                     | 10      |                       |
| Beef, round or rump roast | 2              | 1                 | 1             | 1               | 2            | 2                       | 3               | 0                | 0                     | 3       |                       |
| Beef, loin roast          | 1              | 0                 | 0             | 0               | 1            | 0                       | 1               | 0                | 0                     | 1       |                       |
| Beef, round steak         | 4              | 5                 | 4             | 4               | 6            | 6                       | 6               | 6                | 3                     | 5       |                       |
| Poultry, all types        | 3              | 6                 | 5             | 2               | 4            | 0                       | 4               | 5                | 0                     | 4       |                       |
| Beef, chuck roast         | 2              | 1                 | 0             | 3               | 3            | 0                       | 0               | 2                | 0                     | 4       |                       |
| Veal, chops and steak     | 11             | 9                 | 9             | 10              | 16           | 12                      | 10              | 10               | 15                    | 10      |                       |
| Pork, ham                 | 9              | 4                 | 6             | 10              | 5            | 4                       | 6               | 3                | 10                    | 11      |                       |
| Beef, other               | 7              | 8                 | 9             | 5               | 6            | 15                      | 7               | 5                | 5                     | 5       |                       |
| Beef, ground              | 30             | 29                | 28            | 36              | 24           | 29                      | 29              | 34               | 46                    | 28      |                       |
| Seafood, all types        | 3              | 3                 | 3             | 3               | 4            | 0                       | 1               | 3                | 5                     | 3       |                       |
| Pork, chops and steak     | 13             | 17                | 16            | 14              | 7            | 15                      | 17              | 19               | 5                     | 12      |                       |
| Pork, roast               | 1              | 0                 | 0             | 1               | 1            | 0                       | 0               | 1                | 0                     | 1       |                       |
| Lamb, all types           | 0              | 1                 | 0             | 0               | 1            | 0                       | 0               | 0                | 0                     | 1       |                       |
| Veal, roast and other     | 1              | 1                 | 1             | 1               | 1            | 0                       | 3               | 0                | 0                     | 0       |                       |
| Beef, stew                | 3              | 4                 | 4             | 2               | 1            | 0                       | 6               | 1                | 3                     | 2       |                       |
| Pork, other               | 1              | 4                 | 3             | 1               | 0            | 6                       | 0               | 3                | 0                     | 0       |                       |
| Miscellaneous             | 0              | 1                 | 1             | 1               | 0            | 0                       | 0               | 1                | 0                     | 0       |                       |
| No answer                 | 1              | 2                 | 2             | 0               | 0            | 6                       | 0               | 0                | 0                     | 0       |                       |
| Total                     | 101            | 100               | 98            | 101             | 99           | 99                      | 100             | 99               | 100                   | 100     |                       |

(Continued)



APPENDIX TABLE 7.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              |               | Percent | Education of homemaker   |                         |                  | Education of husband     |                         |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|---------------|---------|--------------------------|-------------------------|------------------|--------------------------|-------------------------|------------------|
|                           |                       |              |              |              |               |         |                          |                         |                  |                          |                         |                  |
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37) |         | Elemen-<br>tary<br>(155) | High<br>school<br>(287) | College<br>(139) | Elemen-<br>tary<br>(151) | High<br>school<br>(185) | College<br>(142) |
| Beef, loin steak          | 5                     | 5            | 11           | 12           | 16            | 8       | 6                        | 12                      | 5                | 7                        | 11                      |                  |
| Beef, round or rump roast | 0                     | 1            | 2            | 5            | 0             | 1       | 1                        | 4                       | 1                | 1                        | 3                       |                  |
| Beef, loin roast          | 0                     | 0            | 1            | 0            | 0             | 0       | 1                        | 0                       | 0                | 0                        | 1                       |                  |
| Beef, round steak         | 3                     | 6            | 1            | 5            | 14            | 4       | 5                        | 5                       | 4                | 5                        | 6                       |                  |
| Poultry, all types        | 8                     | 4            | 3            | 3            | 0             | 5       | 3                        | 3                       | 5                | 1                        | 4                       |                  |
| Beef, chuck roast         | 0                     | 1            | 3            | 2            | 5             | 0       | 2                        | 4                       | 1                | 2                        | 2                       |                  |
| Veal, chops and steak     | 8                     | 10           | 14           | 12           | 5             | 8       | 10                       | 13                      | 9                | 12                       | 9                       |                  |
| Pork, ham                 | 5                     | 6            | 10           | 9            | 11            | 4       | 7                        | 12                      | 4                | 8                        | 9                       |                  |
| Beef, other               | 17                    | 4            | 6            | 5            | 8             | 7       | 7                        | 6                       | 9                | 7                        | 6                       |                  |
| Beef, ground              | 29                    | 34           | 28           | 23           | 30            | 35      | 31                       | 23                      | 29               | 38                       | 26                      |                  |
| Seafood, all types        | 3                     | 3            | 2            | 6            | 3             | 2       | 3                        | 4                       | 2                | 1                        | 6                       |                  |
| Pork, chops and steak     | 10                    | 16           | 15           | 14           | 8             | 14      | 17                       | 9                       | 19               | 12                       | 13                      |                  |
| Pork, roast               | 0                     | 0            | 0            | 2            | 0             | 0       | 0                        | 1                       | 0                | 1                        | 0                       |                  |
| Lamb, all types           | 0                     | 0            | 0            | 2            | 0             | 0       | 0                        | 1                       | 0                | 0                        | 1                       |                  |
| Veal, roast and other     | 1                     | 2            | 1            | 2            | 0             | 2       | 1                        | 1                       | 2                | 1                        | 0                       |                  |
| Beef, stew                | 2                     | 4            | 3            | 0            | 0             | 5       | 2                        | 1                       | 4                | 3                        | 1                       |                  |
| Pork, other               | 3                     | 2            | 1            | 0            | 0             | 2       | 2                        | 1                       | 3                | 2                        | 1                       |                  |
| Miscellaneous             | 1                     | 0            | 0            | 2            | 0             | 0       | 1                        | 1                       | 1                | 0                        | 1                       |                  |
| No answer                 | 3                     | 1            | 0            | 0            | 0             | 1       | 0                        | 0                       | 2                | 1                        | 0                       |                  |
| Total                     | 98                    | 99           | 102          | 104          | 100           | 98      | 99                       | 101                     | 100              | 102                      | 100                     |                  |

APPENDIX TABLE 8.—Influence of Demographic Factors on Cuts of Meat Suggested for a Large Family with Small Children

| Cut of meat               | Race           |                   | Family income |                 |              |  | Occupation of husband   |                 |                  |                       | Percent | Profes-<br>sional<br>(153) |
|---------------------------|----------------|-------------------|---------------|-----------------|--------------|--|-------------------------|-----------------|------------------|-----------------------|---------|----------------------------|
|                           | White<br>(427) | Nonwhite<br>(161) | Low<br>(278)  | Medium<br>(208) | High<br>(99) |  | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) |         |                            |
| Beef, loin steak          | 1              | 3                 | 1             | 1               | 2            |  | 0                       | 6               | 1                | 0                     |         | 1                          |
| Beef, round or rump roast | 5              | 3                 | 4             | 6               | 8            |  | 2                       | 4               | 4                | 10                    |         | 7                          |
| Beef, loin roast          | 6              | 3                 | 4             | 6               | 4            |  | 6                       | 1               | 5                | 5                     |         | 5                          |
| Beef, round steak         | 4              | 2                 | 2             | 4               | 6            |  | 0                       | 3               | 3                | 5                     |         | 5                          |
| Poultry, all types        | 26             | 22                | 25            | 23              | 28           |  | 21                      | 28              | 24               | 26                    |         | 28                         |
| Beef, chuck roast         | 7              | 0                 | 3             | 7               | 7            |  | 4                       | 1               | 6                | 5                     |         | 9                          |
| Veal, chops and steak     | 1              | 1                 | 1             | 1               | 1            |  | 0                       | 1               | 0                | 3                     |         | 1                          |
| Pork, ham                 | 1              | 3                 | 1             | 1               | 2            |  | 0                       | 1               | 1                | 0                     |         | 1                          |
| Beef, other               | 3              | 3                 | 4             | 3               | 5            |  | 0                       | 4               | 4                | 5                     |         | 4                          |
| Beef, ground              | 34             | 33                | 34            | 38              | 28           |  | 40                      | 35              | 39               | 23                    |         | 30                         |
| Seafood, all types        | 0              | 4                 | 3             | 0               | 0            |  | 0                       | 3               | 2                | 0                     |         | 0                          |
| Pork, chops and steak     | 1              | 1                 | 1             | 1               | 1            |  | 2                       | 0               | 0                | 0                     |         | 1                          |
| Pork, roast               | 1              | 1                 | 1             | 1               | 0            |  | 2                       | 0               | 1                | 3                     |         | 0                          |
| Lamb, all types           | 0              | 1                 | 0             | 0               | 0            |  | 0                       | 0               | 0                | 0                     |         | 0                          |
| Veal, roast and other     | 1              | 2                 | 1             | 1               | 1            |  | 0                       | 3               | 1                | 0                     |         | 1                          |
| Beef, stew                | 9              | 18                | 15            | 9               | 6            |  | 19                      | 10              | 10               | 15                    |         | 7                          |
| Pork, other               | 0              | 1                 | 1             | 0               | 0            |  | 0                       | 0               | 0                | 0                     |         | 0                          |
| Miscellaneous             | 0              | 0                 | 0             | 0               | 0            |  | 0                       | 0               | 0                | 0                     |         | 0                          |
| No answer                 | 1              | 1                 | 1             | 1               | 0            |  | 4                       | 0               | 0                | 0                     |         | 0                          |
| Total                     | 101            | 102               | 102           | 103             | 99           |  | 100                     | 100             | 101              | 100                   |         | 100                        |

(Continued)

APPENDIX TABLE 8.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              |               | Education of homemaker |                          |                         | Education of husband |                          |                         |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|---------------|------------------------|--------------------------|-------------------------|----------------------|--------------------------|-------------------------|------------------|
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37) | Percent                | Elemen-<br>tary<br>(155) | High<br>school<br>(287) | College<br>(139)     | Elemen-<br>tary<br>(151) | High<br>school<br>(185) | College<br>(142) |
|                           |                       |              |              |              |               |                        |                          |                         |                      |                          |                         |                  |
| Beef, loin steak          | 2                     | 1            | 1            | 3            | 3             |                        | 1                        | 1                       | 2                    | 1                        | 2                       | 1                |
| Beef, round or rump roast | 3                     | 3            | 5            | 12           | 11            |                        | 4                        | 5                       | 7                    | 3                        | 5                       | 9                |
| Beef, loin roast          | 2                     | 3            | 7            | 6            | 8             |                        | 3                        | 6                       | 4                    | 5                        | 4                       | 6                |
| Beef, round steak         | 1                     | 4            | 5            | 2            | 0             |                        | 3                        | 4                       | 3                    | 1                        | 5                       | 4                |
| Poultry, all types        | 16                    | 29           | 23           | 23           | 30            |                        | 21                       | 23                      | 32                   | 23                       | 23                      | 30               |
| Beef, chuck roast         | 2                     | 4            | 8            | 8            | 5             |                        | 1                        | 6                       | 7                    | 3                        | 8                       | 6                |
| Beef, chops and steak     | 1                     | 0            | 2            | 0            | 0             |                        | 1                        | 0                       | 1                    | 0                        | 1                       | 0                |
| Pork, ham                 | 2                     | 1            | 1            | 0            | 3             |                        | 2                        | 1                       | 1                    | 1                        | 1                       | 1                |
| Beef, other               | 4                     | 4            | 4            | 6            | 0             |                        | 3                        | 5                       | 2                    | 4                        | 3                       | 4                |
| Beef, ground              | 37                    | 32           | 36           | 32           | 35            |                        | 34                       | 36                      | 32                   | 38                       | 35                      | 30               |
| Seafood, all types        | 5                     | 1            | 1            | 0            | 0             |                        | 3                        | 1                       | 0                    | 3                        | 1                       | 0                |
| Pork, chops and steak     | 1                     | 0            | 1            | 2            | 0             |                        | 1                        | 1                       | 1                    | 1                        | 1                       | 1                |
| Pork, roast               | 0                     | 1            | 1            | 0            | 0             |                        | 1                        | 0                       | 0                    | 1                        | 1                       | 0                |
| Lamb, all types           | 0                     | 0            | 0            | 0            | 0             |                        | 1                        | 0                       | 0                    | 0                        | 0                       | 0                |
| Veal, roast and other     | 1                     | 1            | 1            | 0            | 0             |                        | 2                        | 0                       | 1                    | 1                        | 2                       | 0                |
| Beef, stew                | 17                    | 14           | 5            | 8            | 5             |                        | 19                       | 10                      | 7                    | 15                       | 8                       | 9                |
| Pork, other               | 2                     | 0            | 0            | 0            | 0             |                        | 1                        | 0                       | 0                    | 0                        | 0                       | 0                |
| Miscellaneous             | 0                     | 0            | 0            | 0            | 0             |                        | 0                        | 0                       | 0                    | 0                        | 0                       | 0                |
| No answer                 | 2                     | 1            | 0            | 0            | 0             |                        | 1                        | 0                       | 1                    | 1                        | 1                       | 0                |
| Total                     | 98                    | 99           | 101          | 102          | 100           |                        | 102                      | 99                      | 101                  | 101                      | 101                     | 101              |

APPENDIX TABLE 9.—Influence of Demographic Factors on Cuts of Meat Suggested for a Regular Inexpensive Meal

| Cut of meat               | Race        |                | Family income |              |           | Percent | Occupation of husband |              |               |               | Professional (153) |
|---------------------------|-------------|----------------|---------------|--------------|-----------|---------|-----------------------|--------------|---------------|---------------|--------------------|
|                           | White (427) | Nonwhite (161) | Low (278)     | Medium (208) | High (99) |         | Unemployed (52)       | Service (72) | Skilled (151) | Clerical (39) |                    |
|                           |             |                |               |              |           |         |                       |              |               |               |                    |
| Beef, loin steak          | 1           | 2              | 1             | 2            | 1         | 0       | 1                     | 2            | 3             | 1             |                    |
| Beef, round or rump roast | 1           | 0              | 0             | 1            | 0         | 0       | 1                     | 1            | 0             | 1             |                    |
| Beef, loin roast          | 1           | 1              | 1             | 2            | 0         | 0       | 0                     | 3            | 0             | 1             |                    |
| Beef, round steak         | 4           | 1              | 1             | 4            | 5         | 0       | 3                     | 2            | 8             | 5             |                    |
| Poultry, all types        | 14          | 16             | 14            | 16           | 9         | 17      | 22                    | 18           | 13            | 12            |                    |
| Beef, chuck roast         | 2           | 1              | 1             | 3            | 1         | 2       | 0                     | 1            | 3             | 3             |                    |
| Veal, chops and steak     | 1           | 2              | 1             | 1            | 3         | 0       | 3                     | 1            | 0             | 3             |                    |
| Pork, ham                 | 2           | 4              | 3             | 2            | 2         | 4       | 0                     | 1            | 3             | 1             |                    |
| Beef, other               | 8           | 11             | 10            | 4            | 12        | 8       | 7                     | 8            | 3             | 12            |                    |
| Beef, ground              | 41          | 33             | 35            | 41           | 44        | 39      | 29                    | 40           | 44            | 39            |                    |
| Seafood, all types        | 1           | 6              | 4             | 1            | 2         | 4       | 3                     | 3            | 3             | 2             |                    |
| Pork, chops and steak     | 8           | 1              | 5             | 7            | 9         | 0       | 8                     | 7            | 10            | 9             |                    |
| Pork, roast               | 1           | 1              | 0             | 1            | 1         | 0       | 0                     | 1            | 3             | 1             |                    |
| Lamb, all types           | 0           | 1              | 0             | 0            | 0         | 0       | 0                     | 0            | 0             | 0             |                    |
| Veal, roast and other     | 3           | 1              | 2             | 3            | 2         | 4       | 3                     | 0            | 3             | 2             |                    |
| Beef, stew                | 9           | 12             | 13            | 9            | 5         | 8       | 14                    | 10           | 8             | 7             |                    |
| Pork, other               | 3           | 7              | 6             | 2            | 2         | 10      | 6                     | 3            | 0             | 2             |                    |
| Miscellaneous             | 0           | 0              | 0             | 0            | 1         | 0       | 0                     | 0            | 0             | 0             |                    |
| No answer                 | 1           | 1              | 1             | 0            | 0         | 6       | 0                     | 0            | 0             | 0             |                    |
| Total                     | 101         | 101            | 98            | 99           | 99        | 102     | 100                   | 101          | 104           | 101           |                    |

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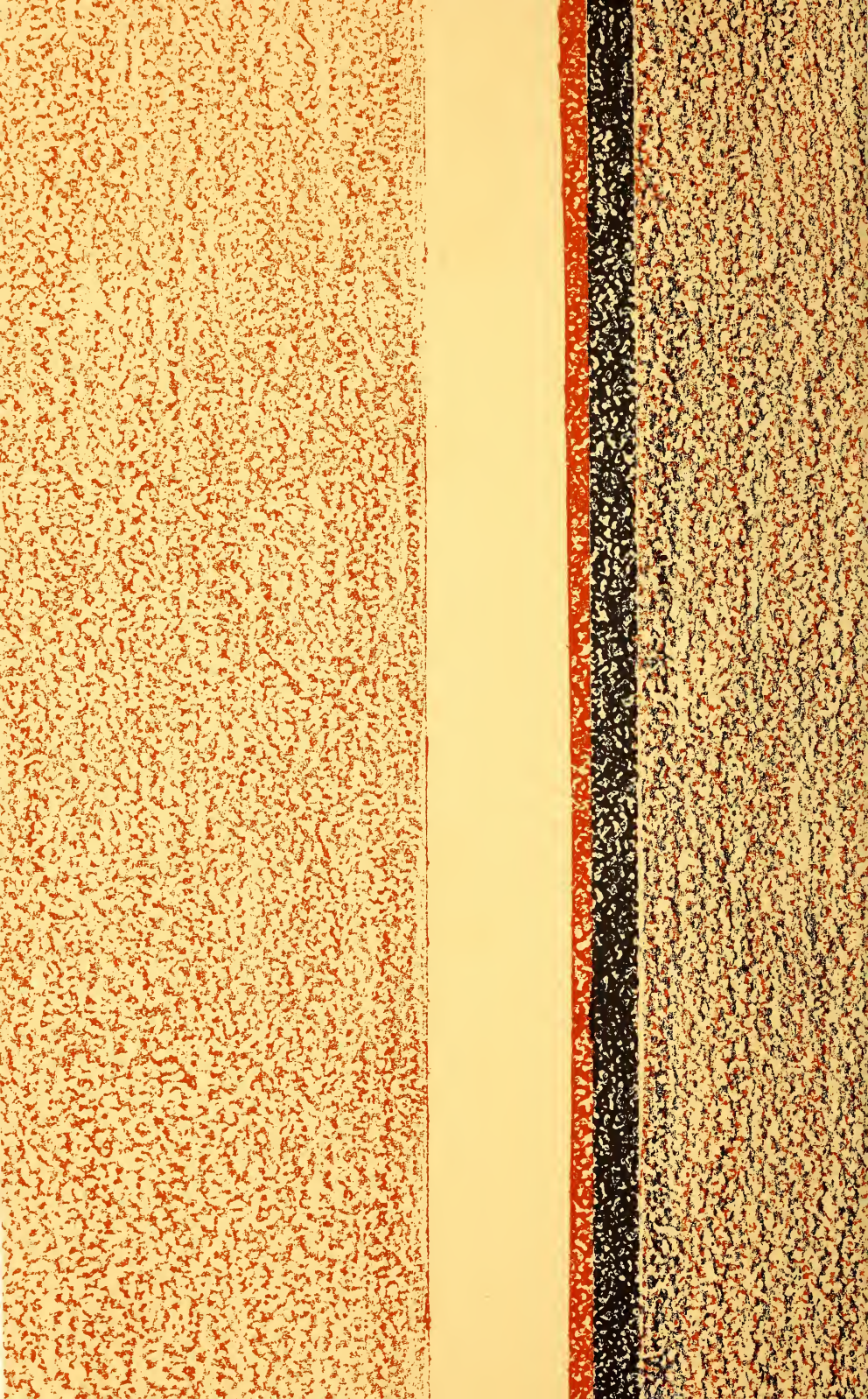


APPENDIX TABLE 9.—(Continued)

| Cut of meat               | Level-of-living score |              |              |              |               | Education of homemaker |                          |                         |                  | Education of husband     |                         |                  |
|---------------------------|-----------------------|--------------|--------------|--------------|---------------|------------------------|--------------------------|-------------------------|------------------|--------------------------|-------------------------|------------------|
|                           | 0-2<br>(89)           | 3-5<br>(248) | 6-8<br>(148) | 9-11<br>(66) | 12-18<br>(37) | Percent                | Elemen-<br>tary<br>(155) | High<br>school<br>(287) | College<br>(139) | Elemen-<br>tary<br>(151) | High<br>school<br>(185) | College<br>(142) |
|                           |                       |              |              |              |               |                        |                          |                         |                  |                          |                         |                  |
| Beef, loin steak          | 2                     | 1            | 3            | 0            | 3             | —                      | 3                        | 1                       | 1                | 3                        | 0                       | 2                |
| Beef, round or rump roast | 0                     | 1            | 1            | 0            | 0             | —                      | 0                        | 1                       | 0                | 0                        | 2                       | 0                |
| Beef, loin roast          | 0                     | 1            | 2            | 2            | 0             | —                      | 1                        | 1                       | 2                | 1                        | 2                       | 1                |
| Beef, round steak         | 1                     | 2            | 6            | 3            | 5             | —                      | 1                        | 5                       | 3                | 2                        | 3                       | 4                |
| Poultry, all types        | 11                    | 16           | 16           | 15           | 5             | —                      | 12                       | 16                      | 14               | 11                       | 20                      | 15               |
| Beef, chuck roast         | 2                     | 0            | 3            | 3            | 3             | —                      | 3                        | 2                       | 1                | 1                        | 3                       | 1                |
| Veal, chops and steak     | 3                     | 0            | 1            | 0            | 8             | —                      | 1                        | 1                       | 3                | 1                        | 1                       | 3                |
| Pork, ham                 | 3                     | 3            | 1            | 2            | 3             | —                      | 5                        | 1                       | 3                | 3                        | 1                       | 1                |
| Beef, other               | 18                    | 7            | 6            | 6            | 14            | —                      | 12                       | 7                       | 7                | 11                       | 6                       | 9                |
| Beef, ground              | 24                    | 41           | 40           | 53           | 32            | —                      | 35                       | 38                      | 45               | 37                       | 37                      | 44               |
| Seafood, all types        | 5                     | 3            | 1            | 3            | 3             | —                      | 4                        | 3                       | 1                | 2                        | 3                       | 1                |
| Pork, chops and steak     | 2                     | 7            | 9            | 3            | 14            | —                      | 1                        | 8                       | 9                | 4                        | 10                      | 8                |
| Pork, roast               | 0                     | 0            | 1            | 0            | 3             | —                      | 1                        | 0                       | 1                | 1                        | 1                       | 1                |
| Lamb, all types           | 1                     | 0            | 0            | 0            | 0             | —                      | 0                        | 0                       | 1                | 0                        | 0                       | 0                |
| Veal, roast and other     | 1                     | 2            | 4            | 2            | 0             | —                      | 2                        | 1                       | 2                | 2                        | 1                       | 3                |
| Beef, stew                | 11                    | 13           | 6            | 8            | 5             | —                      | 13                       | 11                      | 7                | 15                       | 7                       | 6                |
| Pork, other               | 11                    | 3            | 2            | 2            | 3             | —                      | 7                        | 3                       | 1                | 6                        | 4                       | 1                |
| Miscellaneous             | 0                     | 0            | 1            | 0            | 0             | —                      | 0                        | 0                       | 1                | 1                        | 0                       | 0                |
| No answer                 | 3                     | 0            | 0            | 0            | 0             | —                      | 1                        | 1                       | 0                | 2                        | 1                       | 0                |
| Total                     | 98                    | 100          | 103          | 102          | 101           | —                      | 102                      | 100                     | 102              | 103                      | 102                     | 100              |







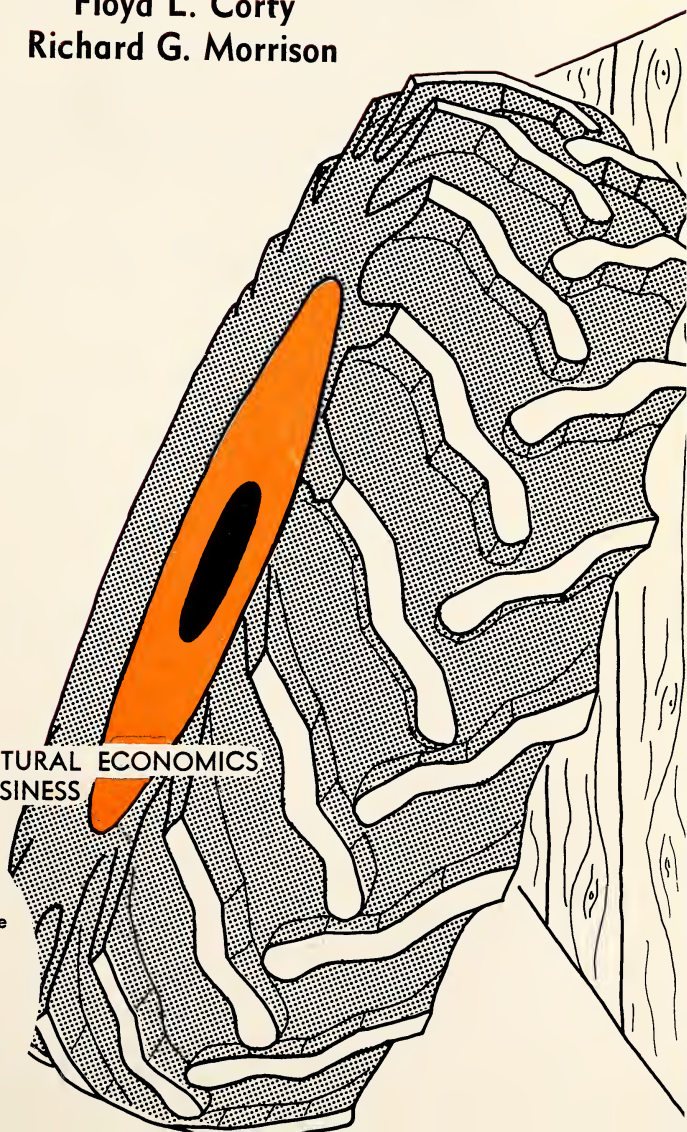


# THE RETAIL FARM EQUIPMENT BUSINESS IN LOUISIANA

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In Cooperation with  
Small Business Administration  
Washington, D.C.



## Foreword

This study of the retail farm equipment business in Louisiana is one of five agribusiness studies contributing to a project under the general title, "An Economic Analysis of Problems Affecting the Success of Selected Small Agricultural Businesses in Louisiana." The other four phases are concerned with:

1. Feed, seed, and fertilizer supply stores.
2. Local grain elevators.
3. Feed and oil mills.
4. Local agricultural canning, packing, and processing plants.

These agribusinesses have problems peculiar to their close relationship to agriculture and, although they perform a very important service to farmers and the community, they have been relatively neglected in terms of economic research.

These studies are intended to provide a first look at these important agriculturally oriented small businesses in the state and to specifically recognize the incidence, magnitude, and nature of problems which confront them.

This research project was conducted by the Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, Louisiana State University, and financed in part by the Small Business Administration, Washington, D.C.

Professional personnel engaged in the project include:

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# **The Retail Farm Equipment Business In Louisiana**



*Prepared at*  
The Louisiana State University  
Baton Rouge, Louisiana  
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*Awarded to the*  
Department of Agricultural Economics and Agribusiness

*By*  
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# The Retail Farm Equipment Business In Louisiana

By FLOYD L. CORTY AND RICHARD G. MORRISON<sup>1</sup>

## Introduction

Without farm equipment, farming would be very primitive indeed. It is difficult to imagine a farm without the machines and equipment currently in use. Many implements are considered commonplace today, but it was less than 50 years ago that farm tractors began to displace horses and mules. The remarkable trend toward farm mechanization is well demonstrated by comparing the increase in number of farm tractors with the decrease in number of horses and mules. In 1910 there were an estimated one thousand farm tractors and 24 million horses and mules on farms in the United States. Today there are approximately five million tractors and only three million horses and mules.<sup>2</sup>

A major item of expenditure on many farms in the United States is the cost of owning and operating farm machinery. Among 30 types of commercial family-operated farms, annual expenditures range from \$400 on small tobacco farms in the Coastal Plain of North Carolina to \$6,700 on irrigated cotton farms in the High Plains of Texas, or an average of \$2,500 per farm.<sup>3</sup>

According to this study the value of farm equipment purchased in Louisiana in 1959 was about \$60 million. In addition, farm expenditures for gasoline and other petroleum fuel and oil amounted to almost \$20 million, thus making a total of about \$80 million in expenditures by Louisiana farmers in 1959 for purchase and operation of farm machinery.<sup>4</sup>

There have been relatively few studies directed to the farm equipment business. A study by Fliginger in South Dakota recognized the importance of this farm related enterprise and mentioned some of its

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<sup>2</sup>*Implement and Tractor*, 1014 Wyandotte, Kansas City 5, Missouri, November 15, 1961, p. 86.

<sup>3</sup>"Cost of Farm Machinery," by James Vermeer and Donald T. Black, *The Yearbook of Agriculture*, 1961, p. 339. The U.S. Government Printing Office, Washington 25, D.C.

<sup>4</sup>*U.S. Census of Agriculture 1959, Louisiana*, Volume 1, Part 35, p. 36, U.S. Department of Commerce, Bureau of the Census.

problems.<sup>5</sup> According to Fliginger the four principal problems were: (1) open account credit, (2) credit for maintaining inventory equipment, (3) interpretation of the South Dakota Sales Tax Law, and (4) scalpers—"fly-by-night" dealers who sell equipment but provide no service or repairs.

A report by Parsons, Robinson and Strickler of the Agricultural Research Service, United States Department of Agriculture, was concerned with the depreciation and replacement of farm equipment.<sup>6</sup> It emphasized, on a national basis, the problem created by the growing supply of used machinery on the market. Apparently one-third to one-half of the farm machinery currently in use was purchased as used equipment by the current owners.

An Indiana study, which concentrated on the problem of open account credit facing farm suppliers, reported that farm equipment dealers rarely charged interest on open account credit.<sup>7</sup> Open accounts were considered due 30 days after billing date. Forty percent of the dealers reported less than one-half of their open accounts paid by the due date. It usually required 90 days or longer to collect from 90 to 100 percent of the accounts. About 20 percent of the dealers started charging interest after the account had been delinquent six months.

## Purpose of the Study

Despite the importance of the farm equipment business to the economy of Louisiana there has been practically no published data regarding these firms, the services they provide, or the problems they face.

This study presents data which will give a better understanding of the nature, scope, and general problems of the Louisiana retail farm equipment firms.

The following specific objectives gave direction to the study:

1. To determine the number, size, and location of the retail farm equipment firms in Louisiana.
2. To determine the type of organization, employment provided, and other characteristics of these firms.
3. To determine the nature and incidence of problems, such as seasonality of business, credit, federal farm programs, technical

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<sup>5</sup>Fliginger, John C., *Farm Equipment Retailing in South Dakota*, Agricultural Economics Pamphlet No. 74, Agricultural Economics Department, Agricultural Experiment Station, South Dakota State College, July 1956.

<sup>6</sup>Parsons, Merton S., Frank H. Robinson, and Paul E. Strickler, *Farm Machinery Use, Depreciation and Replacement*, Statistical Bulletin No. 269, Agricultural Research Service, United States Department of Agriculture, Washington, D.C., October 1960.

<sup>7</sup>Cox, Clifton B., and Vernon W. Pherson, *Open Account Credit Policy of Farm Suppliers*, Mimeo EC-138, Agricultural Experiment Station, Lafayette, Indiana, November 1956.

training requirements, and size of service areas, which have an economic impact on local farm machinery businesses.

## Procedure

A complete list of the 214 Louisiana retail farm equipment firms and their addresses in 1960 was obtained from the Deep South Farm

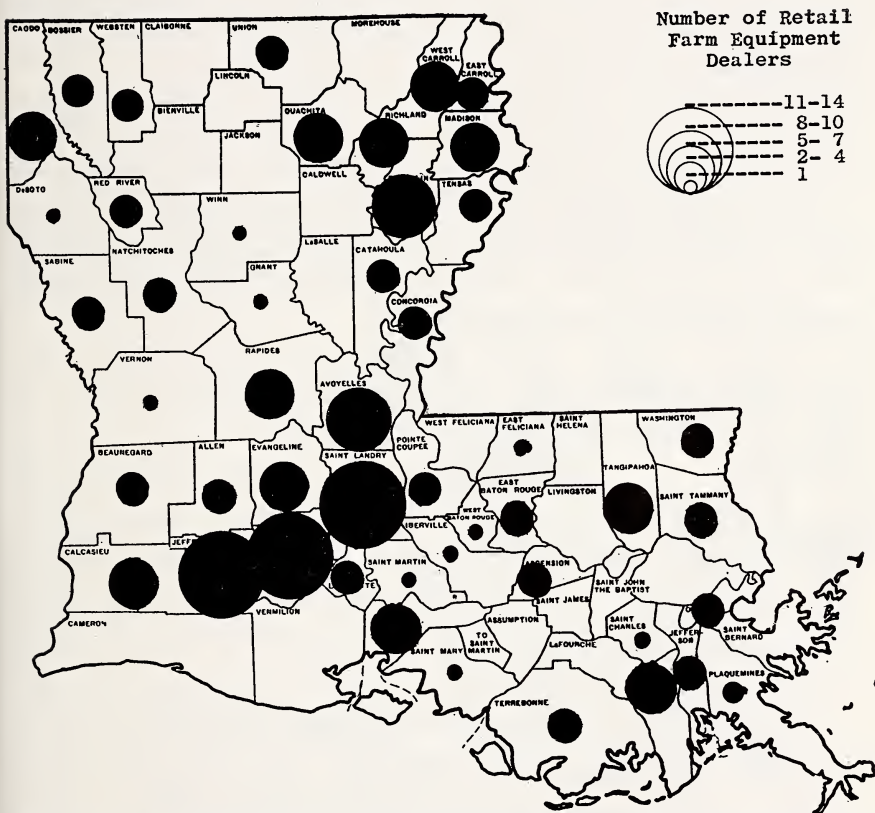


**FIGURE 1.—Distribution of Farm Equipment Firms in Louisiana, by Parishes, 1960.**

Equipment Association. The list included both members and non-members of the association. Their distribution by parishes<sup>8</sup> is shown in Figure 1, and the type of franchise represented by the various firms is indicated in Table 1. Questionnaires requesting information on year of origin, type of ownership, number and class of employees, and volume of business were mailed to each firm. A total of 135 firms, or about 63 per cent, completed and returned the mail questionnaires.

<sup>8</sup>Parishes in Louisiana correspond to counties in other states.

TABLE 1.—Farm Equipment Franchises Held by Louisiana Farm Equipment Firms, 1960

| Franchise               | Total firms |                  |
|-------------------------|-------------|------------------|
|                         | Number      | Percent of total |
| International Harvester | 49          | 22.8             |
| John Deere              | 38          | 17.8             |
| Ford                    | 33          | 15.4             |
| Case                    | 29          | 13.6             |
| Allis-Chalmers          | 19          | 8.9              |
| Massey-Ferguson         | 19          | 8.9              |
| Minneapolis-Moline      | 18          | 8.4              |
| Oliver                  | 9           | 4.2              |
|                         | 214         | 100.0            |

The responses revealed a wide variability in the volume of business done by each firm. Since business techniques and related problems are more closely associated with volume of business than with other descrip-



FIGURE 2.—Geographical Distribution of Retail Farm Equipment Firms Included in Sample for Interview and Observation.



tive characteristics, the volume of business was used as the criterion for determining the size of sample needed to properly describe the farm equipment firms in Louisiana. Thus a 30 percent random sample, consisting of 65 firms, was selected for personal observation and interview. This size of sample was calculated to provide 95 percent assurance that, if all firms were arrayed according to volume of business and grouped in \$50,000 intervals, every group would be represented in the sample.

The sample was selected from the total number of firms and not restricted to those that had previously completed the mail questionnaires. Geographic location of sample firms is indicated in Figure 2.

The subsequent analysis of data utilized both the responses to the mail questionnaires and those obtained through personal interviews. Data obtained by mail questionnaires in 1960 represented business activities for the year 1959. Data collected by personal interviews in 1961 pertained to 1960 and 1961 activities. Thus the reader will note different time periods represented by tabular data.

## **Description of the Retail Farm Equipment Business in Louisiana**

### **Number, Size, and Distribution of Firms**

As was mentioned earlier, there were 214 retail farm equipment firms in Louisiana in 1960. These were situated in 50 of the 64 parishes in the state. The greatest concentration of firms was found in the north-eastern part of the state where cotton is the major cash crop and in the southwestern rice producing area. These two regions contained almost one-half of the total number of farm equipment firms in Louisiana. Parishes without farm equipment firms were primarily those in the cutover pine area of North Central Louisiana and those along the marshy Gulf Coast (Figure 1, Page 5).

In an attempt to determine whether some regions had more farm equipment firms than could be supported by local purchasing power, the estimated gross farm income of each region was allocated among the farm equipment firms therein. The results, however, failed to reveal any distinct relationship (Table 2).

The number of farms per farm equipment firm ranged from 110 in the New Orleans area to 1,466 in the cutover pine area of Central Louisiana. Although the region with the smallest number of farms per firm also reflected the lowest volume of business per firm, regions with the largest number did not show a correspondingly high volume of farm equipment business. The largest median volume of business per firm occurred in three areas having relatively high gross incomes and where

TABLE 2.—Distribution of Farms, Farm Income, and Retail Farm Equipment Firms in Louisiana

| Farming region                           | Equipment firms | Farms* | Average number of farms per firm | Gross estimated farm income per farming area** | Gross farm income allocated per firm | Observed median volume of business per firm*** |
|------------------------------------------|-----------------|--------|----------------------------------|------------------------------------------------|--------------------------------------|------------------------------------------------|
|                                          |                 |        |                                  |                                                |                                      |                                                |
|                                          |                 | Number |                                  |                                                | Thousand dollars                     |                                                |
| North Louisiana Upland Cotton Area       | 7               | 8,975  | 1,282                            | 16,182                                         | 2,311                                | 125 - 150                                      |
| Central Louisiana Cutover Pine Area      | 2               | 2,933  | 1,466                            | 4,567                                          | 2,283                                | - - -                                          |
| Red River Cotton Area                    | 20              | 7,637  | 382                              | 37,325                                         | 1,867                                | 200 - 250                                      |
| Cutover Flatwoods Area                   | 5               | 2,443  | 489                              | 3,165                                          | 634                                  | 150 - 175                                      |
| Mississippi Delta Cotton Area            | 54              | 12,539 | 232                              | 70,986                                         | 1,313                                | 200 - 250                                      |
| Central Louisiana Mixed Farming Area     | 33              | 14,404 | 436                              | 59,262                                         | 1,794                                | 150 - 175                                      |
| Louisiana Rice Area                      | 49              | 7,836  | 160                              | 79,784                                         | 1,629                                | 150 - 175                                      |
| Sugarcane for Sugar Area                 | 18              | 5,882  | 327                              | 51,206                                         | 2,847                                | 200 - 250                                      |
| Loessial Mixed Farming Area              | 6               | 2,498  | 416                              | 7,587                                          | 1,263                                | - - -                                          |
| Cotton, Dairy, and Truck Area            | 13              | 8,521  | 655                              | 25,209                                         | 1,937                                | 125 - 150                                      |
| New Orleans Dairy, Truck, and Fruit Area | 7               | 770    | 110                              | 4,279                                          | 611                                  | 90 - 110                                       |
| STATE TOTAL OR AVERAGE                   | 214             | 74,438 | 348                              | 359,552                                        | 1,681                                | 175 - 200                                      |

\* 1959 Census of Agriculture.

\*\*Circular 240, Department of Agricultural Economics, Louisiana State University, April 1959.

\*\*\*Volume of business was reported as a range to reflect the usual volume over a period of years instead of a single figure for only one year.

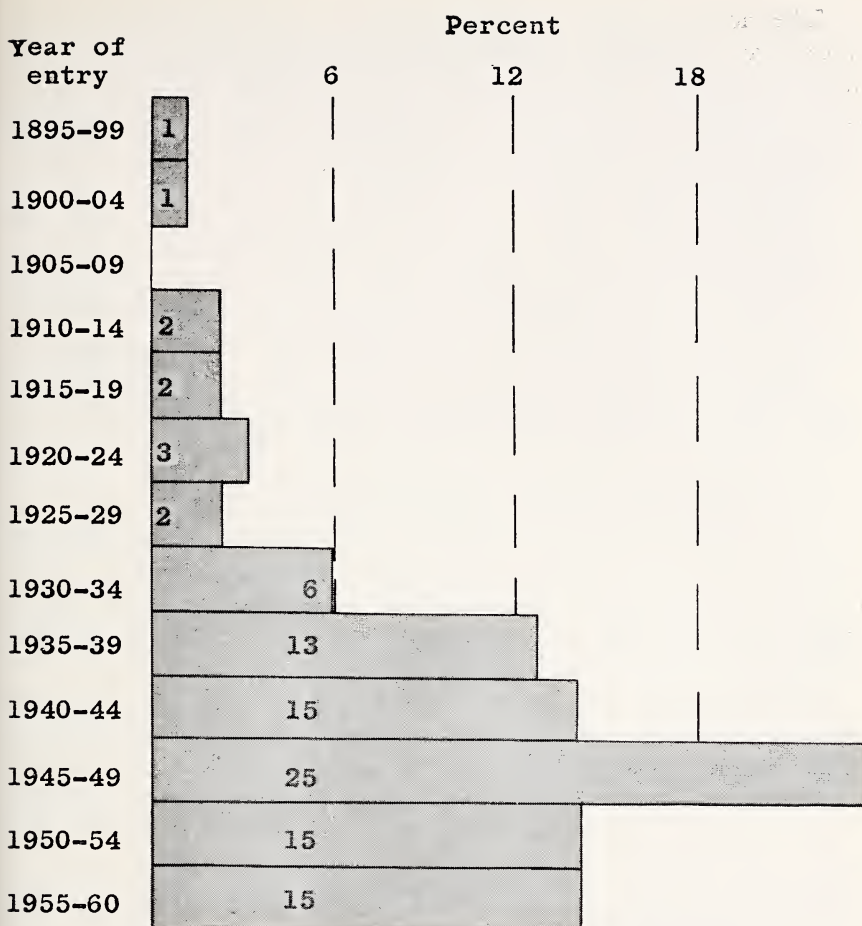


**FIGURE 3.—Percentage of Existing Farm Equipment Firms That Started in Business During Indicated Time Periods.**

the number of farms averaged from 232 to 382 per equipment firm (Table 2).

As would be expected, there was a wide range in the annual volume of business reported by the individual firms. Several firms were doing less than \$25,000 worth of business but there were also several in the million-dollar category. The median annual volume of business is probably the best measure of central tendency to be used for comparison in this instance. It means half of the observations were larger than this middle value and half were smaller. The arithmetic average would be somewhat higher because of the pronounced influence of a few high volume firms.

The median volume of business done by the farm equipment firms in each farming region is given in Table 2. It is apparent that the median values are highest in the river delta cotton and sugarcane regions of the state. Furthermore, the regions with a large number of farms per farm equipment firm are not necessarily the ones where the equipment firms are doing the largest volume of business.

Apparently there are other factors besides number of farms and potential purchasing power in a region which determine the volume of business done by a farm equipment firm. One of these might be the time of entry into the business. Another might well be the type of farming, and a third might be the very important factor of management.

Forty percent of the existing firms in this study started operating in the decade of the 1940's, and another 28 percent began business in the 1950's (Figure 3). Eighty-nine percent of the existing farm equipment firms began operations between 1930 and 1960.

The average size of service area for the farm equipment firms was about 23 miles in radius. Interestingly, there was little appreciable difference in the size of service area among the various farming regions (Table 3). Furthermore, there was very little difference in the size of service area as related to the year the firms started in business (Table 4).

About one-half of the firms were located in towns near the main business district and the other half at the edge of town or only a short distance away. Those located in town generally tried to attract town customers by handling a broader line of merchandise, for example, gardening and hardware supplies, household appliances, and auto and truck

**TABLE 3.—Average Size of Service Area in Relation to Type of Farming Areas, Sample of Retail Farm Equipment Firms in Louisiana, 1960**

| Type of farming area              | Dealers<br>(Number) | Average<br>service area<br>radius<br>(Miles) |
|-----------------------------------|---------------------|----------------------------------------------|
| North Louisiana Upland Cotton     | 3                   | 24                                           |
| Central Louisiana Cutover Pine    | -                   | --                                           |
| Red River Cotton                  | 8                   | 31                                           |
| Cutover Flatwoods                 | 2                   | 29                                           |
| Mississippi Delta Cotton          | 12                  | 19                                           |
| Central Louisiana Mixed Farming   | 10                  | 21                                           |
| Louisiana Rice                    | 16                  | 22                                           |
| Sugarcane for Sugar               | 6                   | 25                                           |
| Loessial Mixed Farming            | 1                   | 43                                           |
| Cotton, Dairy, and Truck          | 5                   | 21                                           |
| New Orleans Dairy, Truck, & Fruit | 1                   | 23                                           |
| Not Reporting                     | 1                   | --                                           |
| Total and average                 | 65                  | 23                                           |



**TABLE 4.—Size of Service Area and Median Volume of Business in 1960 Related to Year Farm Equipment Firms Started in Business**

| Year started in business | Farm equipment firms | Average service area radius | Median volume of business* |
|--------------------------|----------------------|-----------------------------|----------------------------|
| (Years)                  | (Percent)            | (Miles)                     | (Thousand dollars)         |
| 1900 - 1909              | 2                    | 20                          | 175 - 200                  |
| 1910 - 1919              | 4                    | 21                          | 200 - 250                  |
| 1920 - 1929              | 5                    | 21                          | 150 - 175                  |
| 1930 - 1939              | 19                   | 19                          | 250 - 300                  |
| 1940 - 1949              | 40                   | 24                          | 175 - 200                  |
| 1950 - 1959              | 28                   | 24                          | 150 - 175                  |
| After 1959               | 2                    | 30                          | 75 - 100                   |
| Total and average        | 100                  | 23                          | 175 - 200                  |

\*Volume of business was reported within a given range rather than as a single figure.

accessories. Those more rurally oriented confined their business almost exclusively to farm equipment.

## Type of Ownership and Organization<sup>9</sup>

About 60 percent of the farm equipment firms operated under corporate ownership; about 25 percent were owned and operated by a single proprietor, and the remaining 15 percent were partnerships.

Almost one-third of the corporate firms evolved from an earlier single proprietorship or partnership arrangement, whereas only about 5 percent of the single proprietorships or partnerships had previously operated under some other type of ownership.

About one-fifth of the firms could be classed as multiple firms; that is to say, several establishments were operated under one management. About one-fourth of these multiple firms, however, were combined with some non-farm equipment type businesses.

**TABLE 5.—Single or Multiple Plant Operations, 65 Sample Farm Equipment Firms, Louisiana, 1961**

| Firm organization                                  | Total investment per firm | Dealers  |           |
|----------------------------------------------------|---------------------------|----------|-----------|
|                                                    | (Dollars)                 | (Number) | (Percent) |
| Single plant                                       | 114,360                   | 51       | 78.5      |
| Multiple plants, all selling farm equipment        | 178,500                   | 10       | 15.4      |
| Multiple plants, others not selling farm equipment | 70,375                    | 4        | 6.1       |
|                                                    | 121,520                   | 65       | 100.0     |

<sup>9</sup>Additional discussion of ownership and organization can be found on Pages 27 and 29 of this report.

**TABLE 6.—Dimensions of an Average Louisiana Retail Farm Equipment Installation,  
Based on 65 Sample Firms, Louisiana, 1961**

| Facility             | Average size | Percent of<br>total facility |
|----------------------|--------------|------------------------------|
|                      | (Square ft.) | (Percent)                    |
| Service and repairs  | 7,650        | 9.9                          |
| Storage warehouse    | 6,686        | 8.7                          |
| Inside display       | 1,540        | 2.0                          |
| Office               | 420          | .5                           |
| Outdoor display area | 60,984       | 78.9                         |
| Total facility       | 77,280       | 100.0                        |

Establishments which were part of a chain of two or more firms specializing in the farm equipment business had an average investment of \$178,500 per plant compared to an average investment of \$114,360 by the single firms (Table 5). Multiple plants with capital investments shared among other types of businesses had lower investments per firm than the single establishments. The average investment for all firms combined was \$121,520.

### **Size of Installation**

The total area occupied by a typical farm equipment firm was approximately 77,280 square feet, or 1.8 acres (Table 6). The open display area of 60,984 square feet, or 1.4 acres, represented the largest part (78.9 percent) of the total area.

The service and repair area under roof averaged 7,650 square feet. The typical firm also had approximately 6,686 square feet of storage space and 1,540 square feet for inside display. Only 420 square feet was used for office space.

### **Ownership of Facilities**

Although 97 percent of the dealers indicated they would prefer to own both land and buildings, only 45 percent owned the land and 52 percent owned the buildings. Of those who were leasing facilities, about 30 percent indicated they did so as a matter of choice because it was too costly to buy and/or build. Another 50 percent indicated that the necessary site or building was not available for purchase. The remaining 20 percent offered a variety of business reasons for not owning their facilities; business uncertainty was an underlying factor in these reasons.

### **Volume of Business**

In 1960 the volume of business per farm equipment firm in Louisiana ranged from \$8,000 to slightly more than \$1 million, with an average

**TABLE 7.—Volume of Business, Louisiana Retail Farm Equipment Firms, 1960**

| Dollar volume<br>of<br>business | Number<br>of<br>firms | Percent<br>of<br>firms |
|---------------------------------|-----------------------|------------------------|
| Up to 49,999                    | 7                     | 5                      |
| 50,000 — 99,999                 | 23                    | 17                     |
| 100,000 — 149,999               | 16                    | 12                     |
| 150,000 — 199,999               | 25                    | 20                     |
| 200,000 — 249,999               | 14                    | 10                     |
| 250,000 — 299,999               | 10                    | 8                      |
| 300,000 — 349,999               | 6                     | 4                      |
| 350,000 — 399,999               | 7                     | 5                      |
| 400,000 — 449,999               | 6                     | 4                      |
| 450,000 — 499,999               | 5                     | 4                      |
| 500,000 — 599,999               | 5                     | 4                      |
| 600,000 — 699,999               | 5                     | 4                      |
| 700,000 — 799,999               | 2                     | 1                      |
| 800,000 — 899,999               | 2                     | 1                      |
| Over 899,999                    | 2                     | 1                      |
| Total                           | 135                   | 100                    |

volume of \$286,000 per firm. Both the median and the mode values were between \$150,000 and \$200,000 (Table 7). The overall volume of business done by all farm equipment firms in the state was calculated to be about \$61 million in 1960. Only 5 percent of the firms had less than \$50,000 worth of business, and about 50 percent of the firms had \$50,000 to \$200,000 in business volume.

All farm equipment firms consisted of three operating departments, namely, sales, parts, and service. The average computed from the sample firms indicated that 56 percent of the firms' business is realized from the sales department, 24 percent from spare parts, and 20 percent from the service department.

### Seasonality of Business

The volume of business done by the farm equipment firms showed surprisingly little seasonal variation on a state-wide basis, but there was considerable variation on the part of individual firms. The percentage of farm equipment business for the state, by calendar quarters, averaged out as follows: 27 percent the first quarter, 24 percent the second, 24 percent the third, and 25 percent the fourth.

Only 22 percent of the firms indicated no appreciable seasonality in business. About 35 percent of the firms reported doing 35 percent or more of their business in any one season. Furthermore, one out of every ten farm equipment firms did over 50 percent of the business in one of the four seasons. One firm reported 80 percent of its business in the spring.

Seasonality of business was most evident in the rice, sugarcane, and cotton farming areas, in that order of importance.

Firms with a low volume of business during the winter months try to promote winter repair work. Many dealers lamented the fact that many farmers neglect servicing and repairs until early spring — just prior to the planting season. Other practices designed to smooth out seasonal variations in the farm equipment business consist of off-season sales campaigns and promoting sales of allied lines of merchandise. Adding tires, oil, and power saws did not help appreciably, but selling boats along with farm equipment was successful in one area. About one-half of the dealers indicated they made no special effort to smooth out seasonal fluctuations.

## Sales Outlets

Over 85 percent of the Louisiana farm equipment sales were made to farmers. Sales to industry accounted for 12.5 percent. Sales to other retailers and government agencies accounted for the remaining 2 percent.

## Farm Equipment Associations

Two-thirds of the Louisiana farm equipment dealers belong to the Deep South Farm Equipment Dealers' Association, which is one of the 33 state and regional associations affiliated with the National Retail Farm Equipment Association.<sup>10</sup>

The National Association makes insurance coverage available for fire, theft, public liability, plate glass, and group accident and health. The state and national associations also make accounting forms available to dealers. Other services and information available to dealers through the National Farm Equipment Association include: (1) management clinics, (2) a monthly magazine entitled *Farm Equipment Financing*, (3) an annual *Cost of Doing Business* publication, (4) the *Dealer Handbook*, and (5) bookkeeping training schools.

The National Association also employs a full-time representative in the nation's capital, who looks after the legislative interests of farm equipment dealers.

## Trade News

Firm libraries generally consisted of various farm magazines, literature from manufacturers, and publications from the farm equipment association. Dealers indicated that the following publications were most frequently used for trade news: (1) the *Implement and Tractor* (maga-

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<sup>10</sup>Merrifield, Arch S., *Farm Equipment Retailers Handbook*, Farm Equipment Retailing Inc., St. Louis, Missouri, 1953, p. 375.



zine), (2) the *Farm and Power Equipment* (magazine), and (3) the National Retail Farm Equipment Association's annual *Cost of Doing Business* (leaflet). Experiment Station and U.S.D.A. publications were rarely mentioned as valuable sources of information.

Information on technological developments in the farm equipment industry are relayed to dealers primarily through manufacturers and equipment dealers' associations. But experiment stations could fulfill a need by providing economic data on the many aspects of the farm equipment business mentioned throughout this publication, as well as economic data on use of implements, displacement of labor, and efficient capital utilization with regard to farm implements.

## Business Operations

### Price Markup

The cost of doing business varies appreciably among the many farm equipment firms because of differences in scale of operations and in costs of labor, taxes, and other services. Gross profit as a percentage of total sales is frequently used as a measure of the cost of doing business. The national average gross profit for farm equipment firms was reported to be 17.53 percent of sales, which allowed for a net profit margin of 3.33 percent of total sales.<sup>11</sup> The average gross profit for Louisiana firms was 18.63 percent. For individual firms the range extended from 5 to 33 percent. About 80 percent of the firms had gross profits between 11 and 25 percent (Table 8).

### Sale of Used Equipment

The proportion of farm equipment business resulting from the sale of used equipment varied from a low of 4 percent to a high of 50 per-

**TABLE 8.—Gross Profit Required to Break Even, As Reported by 54 Sample Farm Equipment Firms, Louisiana, 1961**

| Gross profit required<br>to break even | Dealers  |           |
|----------------------------------------|----------|-----------|
| (Percent of sales)                     | (Number) | (Percent) |
| 0 — 5                                  | 1        | 1.8       |
| 6 — 10                                 | 5        | 9.3       |
| 11 — 15                                | 14       | 25.9      |
| 16 — 20                                | 15       | 27.8      |
| 21 — 25                                | 14       | 25.9      |
| 26 — 30                                | 2        | 3.7       |
| 31 — 35                                | 3        | 5.6       |
| Total                                  | 54       | 100.0     |

<sup>11</sup>Gross profit as used here refers to operating margin. The 1959 *Cost of Doing Business Study*, The National Retail Farm Equipment Association, 2340 Hampton Street, St. Louis 10, Missouri, p. 2.

cent. The overall average was 22 percent per firm. Used equipment appeared to be a greater part of the business in the cotton and general farming areas (Table 9). This may be explained by the more common tillage implements used in cotton and general farming.

## **Diversification of Business**

About 65 percent of the farm equipment firms confined their business to sale of farm equipment. The remaining 35 percent supplemented sales of farm equipment by adding lines of merchandise such as autos, trucks, hardware, seed, fertilizer, home appliances, and garden equipment.

## **Lending or Leasing Farm Equipment**

This practice is not very common among farm equipment dealers. Any lending or leasing that was reported was done to conduct farm demonstrations or to provide assistance in the event of farming emergencies. Nevertheless, several dealers indicated they were planning to start the practice of leasing equipment to customers, particularly the large, very expensive pieces of equipment that would be used briefly by any individual farmer.

## **Advertising**

Institutional advertising in the farm equipment business refers to market-wide advertising by manufacturers who impose assessments against their dealers. Under one type of institutional advertising the dealer is charged a fee based on his annual volume of business.

A second type consists of distributing sales literature through a manufacturer's mailing list. Under this plan, the dealer supplies the manufacturer with a mailing list of his existing and potential customers and he in turn is assessed the postage necessary for distribution of advertising or other literature. Thus the dealers are usually encouraged to support advertising programs prepared by the manufacturer.

In addition, most Louisiana farm equipment firms practiced some type of individual advertising. This consisted of one or more of the following means: (1) radio, (2) newspaper, (3) mailing lists, (4) farm demonstrations, (5) supplying equipment for 4-H Club and FFA demonstrations, and (6) exhibits at county and state fairs.

Advertising expenditures (excluding institutional advertising) ranged from only a few dollars of incidental advertising to well organized campaigns costing about \$7,000 per year. The average per firm amounted to about \$1,000 annually.

Generally, one would expect firms with the larger volume of business to spend more money on advertising than firms with the smaller volume

TABLE 9.—Proportion of Total Business Attributed to Sale of Used Equipment, by Farming Areas, 65 Sample Farm Equipment Firms, Louisiana, 1960

| Farming area                             | Firms<br>(Number) | Total<br>volume of<br>business<br>(Dollars) | Used equipment      |                                                 |
|------------------------------------------|-------------------|---------------------------------------------|---------------------|-------------------------------------------------|
|                                          |                   |                                             | Volume<br>(Dollars) | Proportion<br>of total<br>business<br>(Percent) |
| North Louisiana Upland Cotton Area       | 3                 | 423,000                                     | 38,750              | 9.2                                             |
| Central Louisiana Cutover Pine Area*     | -                 | -                                           | -                   | -                                               |
| Red River Bottom and Upland Area         | 6                 | 2,534,000                                   | 585,200             | 23.0                                            |
| Cutover Flatwoods Area                   | 2                 | 261,000                                     | 31,650              | 12.0                                            |
| Mississippi Delta Cotton Area            | 10                | 4,390,000                                   | 1,243,000           | 28.3                                            |
| Central Louisiana Mixed Farming Area     | 9                 | 1,965,950                                   | 469,620             | 23.9                                            |
| Louisiana Rice Area                      | 14                | 3,186,849                                   | 412,597             | 13.0                                            |
| Sugarcane for Sugar Area                 | 4                 | 1,334,000                                   | 212,300             | 16.0                                            |
| Loessial Mixed Farming Area              | 2                 | 1,837,000                                   | 456,232             | 24.3                                            |
| Cotton, Dairy, and Truck Area            | 4                 | 673,104                                     | 158,717             | 23.6                                            |
| New Orleans Dairy, Truck, and Fruit Area | 1                 | 500,000                                     | 50,000              | 10.0                                            |
| Not Reporting                            | 10                | -                                           | -                   | -                                               |

\*None in the sample.

of business. Roughly, this was found to be true. Furthermore, those with highest expenditures for individual advertising were those committed to very little institutional advertising. Firms located in urban areas reported larger expenditures for advertising than firms situated in rural farming areas. Also, the newer firms had a larger cash outlay for advertising than the older, well-established firms.

## Investment and Outlook

The value of land, buildings, business vehicles, and average inventory of salable equipment varied from \$10,000 for the smallest firm to \$425,000 for the largest. Fifty percent of the firms had invested less than \$100,000 in their businesses (Table 10). The relatively low investment for many firms is partially due to the fact that both the land and buildings are leased and the chief items of investment are the spare parts, service equipment, and salable supplies. The average total investment per firm was \$121,000. Thus the estimated investment in the total retail farm equipment business of Louisiana amounted to nearly \$26 million in 1961.

The retail farm equipment business has been growing rapidly. About two-thirds of the dealers indicated that during the past ten years they had enlarged the size of their establishment, added new lines of merchandise, or increased the number of employees.

In looking toward the future, about one-half of the dealers expected continued growth and enlargement but the other half were uncertain and rather pessimistic about future prospects.

## Financing

**Investment and Operating Capital:** About one-half of the farm equipment firms existing today started out with borrowed investment

**TABLE 10.—Total Investment, As Reported by 58\* Sample Farm Equipment Firms, Louisiana, 1961**

| Total investment**<br>(Dollars) | Dealers  |           |
|---------------------------------|----------|-----------|
|                                 | (Number) | (Percent) |
| 0 — 49,999                      | 15       | 25.9      |
| 50,000 — 99,999                 | 15       | 25.9      |
| 100,000 — 149,999               | 11       | 19.0      |
| 150,000 — 199,999               | 5        | 8.6       |
| 200,000 — 249,999               | 4        | 6.9       |
| 250,000 — 299,999               | 5        | 8.6       |
| 350,000 — 399,999               | 1        | 1.7       |
| Over 399,999                    | 2        | 3.4       |
| Total                           | 58       | 100.0     |

\*Seven dealers failed to report investment.

\*\*Includes land, buildings, vehicles, and average inventory of salable equipment.



capital. Accumulated savings, bolstered by loans from relatives, were the primary sources of funds. Commercial bank loans at rates of 6 to 8 percent were utilized by about one-fourth of the firms.

A portion of the annual operating capital is borrowed by more than one-half of the farm equipment firms. Interest rates on operating loans obtained from commercial banks were usually 5 or 6 percent.

**Floor Plans and Inventory Financing:** Farm equipment dealers may finance their inventories by various methods. The larger, more expensive items of equipment are usually obtained through a floor plan arrangement with the manufacturer. The floor plans vary in detail with regard to due dates, repayment schedules, and discounts. Most floor plans allow dealers from 6 to 14 months to pay for their inventory machinery. In all cases full payment is required as soon as the equipment is sold to a customer.

The sample of farm equipment dealers reported a range in manufacturer trade discounts from 17.5 to 23.0 percent. The trade discount represents the reduction in list price to arrive at the dealer's purchase price.

When a dealer pays for a machine before the designated due date, many manufacturers allow a *prepayment discount*. This discount varies from 2 to 4 percent, depending on the time remaining before the final due date.

A few farm equipment manufacturers offer *volume discounts* to dealers. These discounts are based on a dealer's total net purchases within a prescribed time period and range from 3.5 to 6.0 percent.

Discounts are also offered by major farm equipment manufacturers when cash payments for spare parts are made before the due dates. In addition, most farm equipment manufacturers grant pre-season stock order discounts ranging from 2 to 4 percent.

Dealers may also finance their inventories through commercial banks or other financing agencies by use of a trust receipt, a chattel mortgage, or a conditional sales contract. A trust receipt is a written agreement between the bank, the dealer, and the manufacturer. The bank buys and takes title to the equipment from the manufacturer. At the same time the dealer is entrusted with the equipment and authorized to sell or otherwise use the equipment as specified in the agreement. The dealer agrees to account to the bank for all transactions and proceeds relating to the financed equipment. In addition, the dealer signs a promissory note for the full value of the equipment plus interest charges. The lending agency holds title to the equipment until full payment is received.

A floor plan chattel mortgage is a written agreement between the dealer and a lending agency, wherein the dealer who has title to inventory equipment pledges this equipment as security for borrowed

capital. The required care, maintenance, use, and final disposition in the event of default are generally specified in the mortgage agreement.

A conditional sale contract differs from the chattel mortgage in that the title is retained by the dealer as security when the equipment is sold. The bank or other financing agency becomes involved only when it purchases the dealer's interest in a contract, or takes assignment of the dealer's interest as collateral for a loan.

**Customer Financing:** Over 95 percent of the farm equipment dealers indicated that local commercial banks were a principal source of funds for customer financing. Many customers borrow from the bank to purchase farm equipment, while others are financed directly by the equipment dealer. In the latter case, the dealer may eventually sell the customer's note to the local bank.

The volume of farm equipment business resulting from customer credit, including open accounts, amounted to almost \$50 million in 1960. It is estimated that 80 to 85 percent of the retail farm equipment business relies upon credit sales. About 13 percent of the firms reported less than \$50,000 worth of business done on credit, but another 13 percent had between \$500,000 and \$900,000 worth of business supported by customer credit (Table 11). The average annual volume of farm equipment business attributed to the availability of customer credit, including open accounts, amounted to \$230,405 per firm in 1960.

About 40 percent of the equipment dealers arranged through their manufacturers to provide customer financing. Another 30 percent had arrangements with commercial credit corporations. In addition to outside sources of financing, about 35 percent of the dealers utilized reserve funds of their own for this purpose.

Credit losses experienced by the retail farm equipment dealers were relatively low. Ten percent of the sample firms were proud to report no credit losses at all. About 30 percent reported credit losses of less than 1 percent of total advanced credit. Almost one-half of the firms, however,

**TABLE 11.—The Volume of Business Resulting from Customer Credit, As Reported by 55 Sample Farm Equipment Firms, Louisiana, 1960**

| Volume of business<br>done on credit | Firms    |           |
|--------------------------------------|----------|-----------|
| (Dollars)                            | (Number) | (Percent) |
| 0 — 49,999                           | 7        | 12.7      |
| 50,000 — 99,999                      | 5        | 9.1       |
| 100,000 — 149,999                    | 14       | 25.6      |
| 150,000 — 199,999                    | 6        | 10.9      |
| 200,000 — 249,999                    | 7        | 12.7      |
| 250,000 — 499,999                    | 9        | 16.3      |
| 500,000 — 900,000                    | 7        | 12.7      |
| Total                                | 55       | 100.0     |

reported losses of 5 percent or more. The highest dollar credit loss by any one firm in 1960 was \$8,500.

**Open Account Credit:** This type of credit refers to charge accounts used by farmers to obtain servicing, repairs, small parts, and miscellaneous items. Open account credit is generally interest-free with periodical or seasonal billing dates. About 98 percent of the Louisiana farm equipment firms had charge account credit for their customers. About 40 percent of the firms had less than \$10,000 of monthly open accounts on the books, while 6 percent had between \$50,000 and \$90,000 in monthly open accounts (Table 12). The most frequent monthly volume of charge accounts was \$6,000 per firm.

Payments on open accounts were demanded in 30 days by most firms. Five percent of the firms, however, geared their open account payments to harvest time. Ten percent indicated that in the event a customer had difficulty paying his open account within a specified time limit, the account was converted into monthly notes at a rather high rate of interest. This practice encouraged farmers to pay open accounts more promptly.

TABLE 12.—Monthly Volume of Open Account Credit, 65 Sample Farm Equipment Firms, Louisiana, 1960

| Average monthly volume<br>of open accounts | Dealers  |           |
|--------------------------------------------|----------|-----------|
| (Dollars)                                  | (Number) | (Percent) |
| 0 — 9,999                                  | 25       | 38.6      |
| 10,000 — 19,999                            | 14       | 21.5      |
| 20,000 — 29,999                            | 10       | 15.4      |
| 30,000 — 39,999                            | 7        | 10.8      |
| 40,000 — 49,999                            | 4        | 6.2       |
| 50,000 — 90,000                            | 4        | 6.0       |
| No open accounts                           | 1        | 1.5       |
| Total                                      | 65       | 100.0     |

Collection of open accounts was a problem for all dealers. Firms attempted to collect delinquent accounts by using one or more of the following methods: (1) past-due notices, (2) form letters, (3) personal letters, (4) phone calls, (5) personal contacts, and (6) lawyers, if absolutely necessary. In all cases, the collection procedure was geared to the individual customer; i.e., the more promising customers were approached on a more informal basis.

## Guarantees

Guarantees on new farm equipment were usually reported as manufacturer warranties ranging from three months to over one year. The

type and length of the guarantee depended primarily upon the brand of product and the type of equipment.

Used machinery guarantees, on the other hand, varied considerably among firms. Guarantees depended upon (1) the individual piece of equipment, (2) the particular customer, and (3) the amount of money involved. A longer coverage and sounder guarantee usually accompanied the more valuable used equipment. Guarantees also varied according to the season during which the equipment was sold. For example, a used tractor sold during the winter or off-season may have a longer guarantee than it would if sold during the harvest season. This recognizes that equipment sold during off-seasons may stand idle for a long period of time before put to intensive use.

Shop repair work usually carried a standard 30-day guarantee. Some dealers, however, did not specify the exact length of their guarantees but merely indicated that the shop work was guaranteed for a reasonable length of time.

## Employment

**Labor Turnover:** In 1960 the Louisiana farm equipment firms employed approximately 2,000 men and 100 women. A measure of labor turnover, based on the number of males replaced by the firm in one year, revealed that over one-half of the firms had greater than 12 per cent labor turnover in 1960 (Table 13).

The relationship between labor turnover and number of employees per firm is rather irregular, but generally a larger percentage turnover is associated with firms having relatively few employees and a low volume of business. Yet the second highest rate or percentage of turnover occurred in the category of firms with the second highest average number of employees (Table 13). However, the category of firms with the highest volume of business and largest number of male employees experienced the lowest rate of turnover.

**TABLE 13.—Average Labor Turnover Related to Volume of Business and Average Number of Male Employees per Firm, 65 Sample Farm Equipment Firms, Louisiana, 1960**

| Volume of business | Dealers  | Average number<br>male employees<br>per firm | Average<br>labor<br>turnover |
|--------------------|----------|----------------------------------------------|------------------------------|
| (Dollars)          | (Number) | (Number)                                     | (Percent)                    |
| 0 — 99,999         | 8        | 4.6                                          | 17.1                         |
| 100,000 — 199,999  | 15       | 6.1                                          | 12.1                         |
| 200,000 — 299,999  | 13       | 7.2                                          | 11.5                         |
| 300,000 — 399,999  | 9        | 11.0                                         | 11.7                         |
| 400,000 — 599,999  | 6        | 14.5                                         | 16.0                         |
| Over 599,999       | 6        | 17.5                                         | 10.3                         |
| Not Reporting      | 8        | — — —                                        | — — —                        |



In general, firms with the largest number of employees and the largest volume of business were located at or near the larger towns.

Female workers were employed as bookkeepers and secretaries by about 50 percent of the firms, and the labor turnover for this group of workers was over 50 percent.

**Fringe Benefits:** Employee benefits included life insurance, hospitalization insurance, annual bonuses, profit sharing programs, and paid vacations.

Generally, the larger firms provided employees with more fringe benefits. About one-half of the firms provided group life insurance plans. About two-thirds of them offered group hospitalization and special bonuses. Profit sharing plans were available from one-fifth of the firms (Table 14).

Paid vacations are an important incentive to an employee in any business, but only 85 percent of the firms provided employees with paid vacations. The length of the vacation was one or two weeks, depending on the tenure status of the worker. Some firms allowed their employees one week vacation for the first one or two years of employment and two weeks thereafter.

**TABLE 14.—Fringe Benefits Provided by 65 Sample Farm Equipment Firms, Louisiana, 1961**

| Employee fringe benefits                           | Dealers* |           |
|----------------------------------------------------|----------|-----------|
|                                                    | (Number) | (Percent) |
| Life insurance (other than Workmen's Compensation) | 34       | 52.3      |
| Hospitalization                                    | 44       | 67.7      |
| Bonuses (Christmas, etc.)                          | 41       | 63.1      |
| Profit sharing (other than bonuses)                | 13       | 20.0      |
| Paid vacations                                     | 55       | 84.6      |

\*A dealer may provide a combination of the several benefits.

Other fringe benefits included: (1) supply and maintenance of the employee's work uniforms, (2) the privilege to buy merchandise from the firm at dealer's cost, and (3) gifts or bonuses to sales winners.

## Bookkeeping

**Accounting and Audits:** About 35 percent of the firms were using their own accounting systems, 35 percent used the system recommended by the National Farm Equipment Association, 22 percent used systems recommended by the manufacturer, and 8 percent of the firms employed certified public accountants.

About 80 percent of the firms had some type of an annual audit, either to assist with income tax reports or for future planning purposes. Most of the larger corporations insisted on annual audits.

**Sales Tax Procedures:** The general sales tax in Louisiana applies to sale of farm equipment as well as to other commodities. Article 2-54 of the rules and regulations promulgated in connection with the Louisiana General Sales Tax, which includes farm equipment, reads:

Article 2-54. *Farm Equipment, tools, supplies, etc.* All farm equipment, machinery, farm tools or any other articles of tangible personal property purchased for use or consumption on the farm are subject to tax imposed by this act, except fertilizer and containers sold directly to the farmer.<sup>12</sup>

The sales tax in Louisiana concerning the sale of new equipment is to be collected on the sale price, or charge which is advanced to the customer. Section 304 of the Sales Tax Law states that:

Dealers shall, as far as practicable, add the amount of the tax imposed under this chapter in conformity with the schedule or schedules to be prescribed by the collector pursuant to authority conferred herein, to the sale price or charge, which shall be a debt from the purchaser or consumer to the dealer, until paid, and shall be recoverable at law in the same manner as other debts. Any dealer who neglects, fails or refuses to collect tax herein provided, shall be liable for and pay the tax himself.<sup>13</sup>

About 80 percent of the Louisiana farm equipment dealers indicated that they collected sales tax on the sale price, whereas 20 percent reported collecting sales tax on the list price. If the sale price and list price are the same, there is no problem, but if the sale price is lower than the list price, the customer taxed on the basis of list price is being taxed in excess of the amount required by the sales tax law.

At the time of this study it was unlawful to collect a sales tax on sale of used equipment previously taken in trade. Act 182 of the 1961 Legislature, however, amended Section 305 of the Sales Tax Law to require that the sales tax on sale of new equipment be based only on the amount in excess of the value of the trade in. A sales tax is then collected on used equipment when it is resold.<sup>14</sup>

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<sup>12</sup>Rules and Regulations Promulgated in Connection With *Louisiana General Sales Tax, Title 47, Section 301-318 as amended*. Issued by Collector of Revenue. Baton Rouge, Louisiana, January 1, 1958, pp. 37-38.

<sup>13</sup>*State of Louisiana Sales Tax Law, Chapter 2 of Subtitle II of Title 47, Louisiana Revised Statutes of 1950, as Amended*. Issued by Collector of Revenue, Department of Revenue, Baton Rouge, Louisiana, 1961, pp. 10-11.

<sup>14</sup>Act 182 became effective August 1, 1962.

# Starting a Farm Equipment Business

## Obtaining a Franchise

Prospective dealers may obtain a franchise to sell major lines of equipment by negotiating a Dealer's Sales Agreement or a Company-Dealer Contract with a representative of the farm equipment manufacturer. The recommended procedure is to have the prospective dealer apply to the manufacturer. The manufacturer will then advise the factory representative in the appropriate district about the prospective dealer, and he in turn will arrange to interview the applicant and evaluate the potential for establishing a new retail outlet. On occasion, factory representatives may be aware of a good market potential in a given area and they will suggest a dealership to a promising businessman having the necessary farm knowledge and experience.

In general, prospective dealers are considered only on the basis that they are qualified in all respects to purchase, sell, service, and finance the company's products on a continuing basis.

Some companies require a guarantee bond to cover purchase of inventories, fixed assets, and miscellaneous start-up costs; others negotiate a title retention agreement which stipulates the company's ownership and control of its goods.

The factory representative evaluates the prospective dealer and the marketing potential of the area. If the proposed location is without a dealer and the sales potential exists, the representative will be happy to consider the qualifications of any interested applicant.

In theory there is no allocation of sales territory; dealers may sell to anyone, anywhere at anytime; but the fact remains that there is some understanding and recognition of sales territories among dealers. A dealer is considered responsible for the development of the maximum sales volume of a company's products in the trade area tributary to his principal place of business. The trade area must be sufficiently large to provide a profitable operation. Dealers may be 10 miles apart or 100 miles apart, depending on type of farming and farm incomes.

Although dealers may sell more than one major brand of equipment, this appears to be a very rare practice. Evidently, manufacturers do not encourage this practice. In fact, they are more likely to discourage mixing of major brands.

Capital requirements to start in business will depend on the size and type of markets. Needed capital may range from \$25,000 to \$100,000 or more, exclusive of land and buildings. Companies discourage applicants where severe undercapitalization is evident.

Sales agreements or contracts may be terminated by mutual agreement with adequate prior notice on the part of either party, as specified

in the contract. Termination can also occur without notice if the dealer fails to abide by the terms of the contract.

Franchises cannot be transferred or assigned by the dealer. The sales agreement must be formally terminated and the company may then re-assign the franchise to a new dealer.

## Time of Entry

Entering the farm equipment business during a period of economic recovery and expansion is frequently the key to success. A knowledge and awareness of the four phases of a business cycle may serve as a guide in deciding upon the most favorable time to enter.

The four phases of a business cycle consist of expansion, peak, contraction and depression. It has been said that the length of a cycle, i.e., from peak to peak, is about nine years.<sup>15</sup> Others recognize economic fluctuations and irregularities which pass through the phases mentioned above, but the sequence of events is not always so clearly defined.<sup>16</sup> There may be hesitations and reversals within each phase and at varying rates of change. There may be a long period of stability within any one phase and an almost imperceptible easing into another phase. Or there may be sudden adjustments plunging the nation from prosperity to depression within a very short time. Also, sudden periods of recovery as witnessed in times of national emergency are usually followed by prolonged periods of economic expansion.

The best time to start in business is difficult to predict, but one cannot refute the good economic judgment of avoiding heavy investment in a declining market. If business has been at its peak for a prolonged period of time, there is a strong probability that the contraction phase, characterized by declining prices, lower farm incomes, and reduced profits, will soon occur. On the other hand, a dealer who starts in business at the beginning of the expansion phase will find his chances for success greatly enhanced.

The period following World War II was characterized by an expansion of economic activity and proved to be an ideal time to enter the retail farm equipment business. And one out of every four of the existing firms entered the business during the period 1945-49. The net profit margin at that time ranged from 7 to 10 percent of sales volume compared to the 3 to 4 percent which prevailed from 1955 to 1959. Currently, economic conditions are becoming stabilized. Dealers report that competition is rather keen and profit margins are declining.

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<sup>15</sup>Tarshis, L., *The Elements of Economics*, Houghton Mifflin Company, New York, 1947, p. 443.

<sup>16</sup>The irregularity and questionable nature of business cycles is aptly discussed by Kenneth Boulding in his revised edition of *Economic Analysis*, Harper and Brothers, New York, 1948, pp. 375-395.



Some dealers sound a note of caution to prospective dealers. Others are optimistic and predict continued success in the better agricultural areas of the state. Nevertheless, the trend to fewer farms, continued production controls, and relatively low farm incomes are disturbing signs to retail farm equipment dealers.

## **Type of Ownership**

Decisions as to type of ownership will hinge upon the economic characteristics found in a single proprietorship, partnership, or corporation. The larger firms are generally incorporated and the smaller ones are individual proprietorships.

Each type of ownership has its advantages and disadvantages. The single proprietor, of course, has full liability and control, limited capital strength, and limited life. The partnership permits two or more individuals to pool their skills, resources, and liabilities. The corporation, as the most widely accepted type of ownership, provides for greater capital strength, limited liability, and perpetuity.<sup>17</sup>

Businessmen frequently ask whether there is a particular income tax advantage associated with each of the three types of ownership. Apparently there is no essential difference between the tax rate paid by the individual entrepreneur and a partner of a firm. But there are some unique features about the corporation tax that may provide tax savings, particularly for high income firms. The individual proprietor pays 20 percent on the first \$4,000 of taxable income. This is graduated upward with each increment added to income until a maximum of 91 percent is imposed on that part of taxable income in excess of \$400,000. The corporation rate, on the other hand, is a flat 30 percent on net income of \$25,000 or less, and 52 percent on taxable income in excess of \$25,000.<sup>18</sup>

## **Location**

It has been observed that firms situated near a town's business district attract townspeople customers as well as farmers. The town location, however, usually poses traffic and parking problems as well as space restrictions for an expanding firm.

Location of the firm is an important decision and should be considered very carefully. A knowledge of the sales territory is essential. The mere fact that a community does not have a farm equipment dealer is not sufficient evidence to indicate that the community needs one.

To sell and service farm equipment profitably the firm must be located in or near a good farming area—one that provides a good market

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<sup>17</sup>More detailed information on the advantages and disadvantages of incorporation may be obtained by consulting a competent attorney.

<sup>18</sup>Peculiarities of incorporation laws and recent adjustments in tax rates suggest that decisions be based on advice of a competent tax authority.

for farm equipment. This does not mean that the area with the most farms offers the best chance for success, but rather the area with prosperous farms, a diversity of enterprises, a fair distribution of wealth, and where other farm equipment stores appear busy and successful.

## Size of Investment

There is an old saying, "It takes money to make money." The average size of investment for farm equipment firms in Louisiana was found to be \$121,000—a capital requirement sufficient to deter many would-be dealers. Investment capital by new dealers is often amassed from personal savings, loans from relatives, local banks or federal agencies. Regardless of the source of funds, it has been traditionally held by bankers that a good policy to be followed in any business is that the owners have at least 50 percent equity in the business.

The initial capital needs will vary considerably by type of operation and type of farming area. The absolute minimum, in light of the needed shop equipment, vehicles, equipment inventory, parts inventory, and demonstration equipment, will be almost \$10,000. This assumes that credit will be available for customer purchases. It is also suggested that about \$5,000 in cash be held in reserve for financing used equipment and some emergency expenses.

The above minimum assumes that the new dealer already has the building or buildings necessary for the business. If not, it is recommended that buildings be leased rather than built or purchased. Leasing will reduce immediate capital needs and will permit the newcomer to get experience and evaluate his location without incurring the high investment in real estate.

It is currently estimated that \$6 per square foot is about the minimum cost for building in a Louisiana community (although one dealer reported building for as low as \$3 per square foot). A 5,000-square-foot building would cost \$30,000. Assuming 65 percent of this could be mortgaged and adding \$1,000 for the lot, the total cash requirement for building would be \$11,500. Adding another \$1,500 to this for fixtures such as bins, counters, and office furniture would bring the figure to \$13,000.

In addition to the fixed costs mentioned thus far, there will be recurring monthly expenses to cover payroll, interest, rent, and utilities. These will ordinarily be covered in the normal course of business, but in the beginning about \$3,000 should be designated for this purpose.

Finally, if housing facilities can be leased, one might say it will require an absolute minimum of \$18,000 to \$20,000 to get started in the retail farm equipment business. If, on the other hand, housing is to be

built, another \$13,000 must be added and the total minimum jumps to somewhat more than \$30,000.

A fixed cost sometimes overlooked is the state and city commercial license fee. The fee is based upon volume of business. The average fee was found to be \$200 per firm in rural areas and \$400 per firm in urban areas. The high fee in urban areas results from meeting license requirements by both the state and the city.

Based upon interview responses, most farm equipment dealers suggested the following changes they would make in existing facilities:

1. Enlarge the parts and service departments.
2. Reduce inside display areas and utilize more open storage and outside display space.
3. Increase the office space and sound-proof the office area.

## **The Nature of Problems Confronting Farm Equipment Dealers**

### **Time of Entry**

The decision to start in business undoubtedly results from prolonged deliberation and review of economic factors, but the primary motive is to make a profit. Profits are more readily attainable when business is expanding. It is also easier to establish a foothold and survive the hardships of inexperience during a period of economic recovery. The difficulty arises in predicting economic phases and business profits. A study of profit margins related to time of entry and rate of survival might provide valuable guides for potential dealers.

### **Type of Ownership**

Most managers of incorporated firms were reasonably satisfied with the corporation-type of ownership, but individual proprietors were generally puzzled about the status of their firms. They were particularly concerned over the relative advantages of incorporation over individual ownership, particularly with reference to possible tax savings. Information on state and federal tax burdens at various levels of income and for different types of ownerships would be very helpful.

### **Location**

About 50 percent of the farm equipment firms were satisfied with their present locations. An equal number complained about undesirable features, of which high costs and inconveniences for the customers were of primary concern. The higher costs were generally attributed to transportation difficulties and real estate values. A spatial model program-

ming study to determine the most efficient location of farm equipment firms would be of great value.<sup>19</sup>

## **Specialization or Diversification**

The decision to handle only a few special lines of equipment or to sell a widely diversified line will depend on market potential in the community. The smaller firms usually have to add new lines of merchandise to help bolster the decline in farm equipment business. The more prosperous firms are larger and more specialized. Firms in or near the center of town are more likely to handle a diversity of supplies than those situated in more rural areas. An important question that cannot be adequately answered at this point is: What allied lines of merchandise will contribute most to a farm equipment business that has the desire and capacity to expand its business?

## **Used Equipment**

One of the biggest problems facing equipment dealers is that of handling used equipment. It ties up capital, displaces the sale of new equipment, and frequently is the cause of poor customer relations. Difficulties usually arise over excessive allowances when the used equipment is taken in, and again with regard to guarantees and threat to good will when the used equipment is sold. Whether guarantees are essential in merchandising used equipment provides a good subject for additional study.

## **Equipment Leasing**

Very few dealers rent out farm equipment. Nevertheless, there seems to be an increasing interest in this type of operation. As soon as appropriate guide lines can be determined, standardized lease forms can be devised to specify size of deposits, insurance coverage, penalties for misuse, etc. More research and experience are needed in developing appropriate lease terms and in convincing the farmer that renting equipment may be less costly than owning it.

## **Seasonality of Business**

Seasonality of business appears to be a problem for about three-fourths of the farm equipment firms. A few reported as much as 50 to 80 percent of the business during one season. Special efforts are needed to promote service and repair work during the slack seasons. Allied lines of activity are also suggested. Further study should be directed to discovering techniques for reducing seasonality of business and determining

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<sup>19</sup>Heady, E. O., and W. Candler, *Linear Programming Methods*, Iowa State College Press, Ames, Iowa, 1958.



what related activities might be integrated into the business to ease the seasonality problem.

## Labor

The lack of well-trained personnel was a problem for many firms. This was particularly evident in the service department. Technological changes have occurred so rapidly that the skills and training required to service the new equipment are woefully lacking.

Labor union activity among employees has remained relatively dormant, possibly because of their dispersal and rural orientation.

As would be expected, the fringe benefits to employees varied considerably among firms. Firms offering no major benefits experienced the largest annual labor turnover. It is reasonable to expect that desirable fringe benefits would attract and hold the better trained workers. The need for special training schools should be determined and the importance of fringe benefits evaluated in attracting skilled labor and reducing labor turnover.

## Credit

Credit is an instrument that can be a help or a hindrance, depending on how it is used. It is a big help to dealers if used judiciously.

The difficulty arises in meeting payments, paying interest charges, and collecting delinquent accounts. The firm manager, of course, must be conversant with all angles of the financing problem. How to avoid excess inventory, take advantage of cash or early payment discounts, avoid penalties, and maintain customer good will are all management problems.

Fortunately, farmers as a group are good credit risks and overall credit losses are very small. Nevertheless, it is tedious and costly to keep records on customer credit, particularly on customer open accounts. An important question to be answered is whether volume of business would be appreciably reduced if open account credit were suspended.

## Advertising

Many dealers question the economic feasibility of advertising. A few voiced objections to the contributions they are committed to make to the manufacturer for institutional advertising. The mixed feelings about the effectiveness of advertising are reflected by the wide range of expenditures for this purpose. A few dealers spend practically nothing for advertising while some spend as much as \$7,000 per year. An objective determination of benefit-cost ratios for farm equipment dealers would prove helpful.

## **Guarantees**

The traditional manufacturer's warranties on new equipment are well accepted and pose no particular problem to the dealers. On the other hand, guarantees on used equipment, both sales and repairs, are reported to be a difficult problem. Frequently, the guarantees are negotiated in accord with the individual customer. The nature of the equipment and the nature of the customer are determining factors. Apparently there is no basis for standardizing used equipment guarantees, but it may be possible to determine whether guarantees are necessary to attract and retain customers.

## **Sales Tactics**

Several former dealers who had recently gone out of business objected to the high pressure sales tactics of manufacturer representatives. Apparently they were urged to carry excessively high inventories in the face of a shrinking market. In any event they reported sales pressure tactics as one reason for going out of business. Perhaps a closer look at institutional relationships would help the industry.

## **Accounting Systems**

Many farm equipment managers do a creditable job of supervising the keeping of records. Accordingly, a variety of systems have been developed. The degree of business success, however, depends not only on keeping records but on properly interpreting them and making the necessary business adjustments. A study of the differences in the various accounting systems and the business decisions facilitated by each would be of considerable value to firm managers.

## **Federal Farm Programs**

Farm equipment dealers in most sections of Louisiana indicated that the Soil Bank and crop allotment programs have cut their volume of sales tremendously. Dealers located in the major cotton producing areas were especially concerned with reduced cotton allotments. The rice area dealers had made adjustments to changing market conditions about three to five years ago, and were less critical of the farm programs than they had been previously. Farm equipment dealers located in the dairy areas were apparently little affected.

Dealer complaints centered around the decreased demand for new machinery. Apparently farmers were delaying replacement of old machinery because of the uncertain farm income situation. When replacement can no longer be postponed, they tend to buy used machinery. An abundant supply of used machinery has resulted from curtailed farming operations in areas where the Soil Bank and crop allotment programs

had the greatest effect. More intensive study is needed to objectively decide whether the absence of federal programs would have been more damaging than their presence. Certainly they have stabilized farm prices and these in turn have helped to bolster farm incomes.

## Summary

The 214 retail farm equipment firms in Louisiana are found in 50 of the 64 parishes of the state. The heaviest concentration occurs in the cotton and rice producing areas. The most prosperous establishments were those in areas with many competing firms. About 40 percent of the firms started in business between 1940 and 1949.

Annual volume of business per firm ranged from about \$8,000 to over \$1,000,000, with an average of \$175,000 to \$200,000. Investment averaged slightly over \$120,000 per firm.

Size of service area varied from 10 to 50 miles in radius, but a 23-mile average radius reasonably describes the size of area regardless of regional location, volume of business, or age of the firm.

About one-half of the firms are located in towns. It was observed that these were more likely to handle additional lines of merchandise than the more rural firms.

The average size installation consisted of 1.8 acres, with 1.4 acres used largely for outdoor display. Of the approximately 16,000 square feet under roof, about half was used for service and repairs, about 40 percent for storage of parts and equipment, and the remaining 10 percent for inside display and office space.

The aggregate volume of business done by Louisiana farm equipment firms in 1960 has been estimated to be about \$61 million. On the average about 56 percent of the business is realized from equipment sales, 24 percent from spare parts, and 20 percent from servicing.

The cost of doing business, based on gross profit as percentage of total sales, ranged from 5 percent for the most efficient firm to 33 percent for the least efficient. The average gross profit among Louisiana firms was 18.6 percent of sales, which was slightly above the national average of 17.5 percent.

Used equipment creates problems for many dealers, especially the smaller ones. An average of 22 percent of the volume of business is attributed to the sale of used equipment. The range among individual firms extends from a low of 4 percent to a high of 50 percent. Used equipment sales are more pronounced in the general farming areas of the state.

Lending or leasing farm equipment is expected to become more popular in the near future. About 10 percent of the firms leased out equipment for demonstration or to meet a farming emergency.

Seasonality of business was a problem for about 75 percent of the dealers. Ten percent of the dealers did 50 percent or more of their business during one of the four seasons. About 75 percent of the firms carried on some individual advertising and only 45 percent provided direct support for institutional advertising. Advertising was generally regarded as being of questionable value.

Investment for individual firms ranged from \$10,000 to \$425,000, with an average of \$121,000. The aggregate investment for all firms is estimated at \$26 million. Growth over the past ten years was indicated by at least two-thirds of the firms, but there was a lack of optimism concerning future growth.

Inventory financing is generally available to dealers through floor plan arrangements with equipment manufacturers. Repayment terms vary considerably and discounts are allowed for early payment. Commercial banks may also finance inventory equipment by use of trust receipts.

Customer financing relies to a great degree upon local banks and commercial credit agencies. In 1960 a total of \$53 million of farm equipment business was made possible through customer financing. The aggregate volume of customer credit sales averaged \$230,000 per firm.

Installment purchases by farmers were considered sound credit transactions, and losses on this score averaged less than 1 percent of credit sales. On the other hand, open account credit is a big worry to equipment dealers. (This credit applies to charge accounts used mainly to obtain servicing and repair parts, without interest charges.) Most firms have \$6,000 or more tied up in open accounts from month to month and collection of these accounts becomes an unpleasant chore.

Louisiana farm equipment firms employ about 2,000 men and 100 women. Annual labor turnover for more than one-half of the firms amounts to about 12 percent for the men and about 50 percent for the women. Fringe benefits consisted primarily of paid vacations, bonuses, and group plans for hospitalization and insurance. About 85 percent of the firms offered paid vacations and about two-thirds provided bonuses and group hospitalization.

## Recommendations

Problems facing farm equipment dealers fall within the confines of proper planning and subsequent accounting. To beginners, a very careful appraisal of the market and adequate capital strength are most essential. Minimum capital requirements for a small-scale operation have been estimated to be about \$20,000 if real estate is leased; otherwise over \$30,000 is needed.

Investing is just the beginning, however. Management decisions



mount rapidly as operations advance. Many of these decisions rely on efficient accounting and bookkeeping records.

There remains much more to be done in light of the nature and incidence of problems uncovered by this study. Additional research is needed to determine: (1) the influence of time of entry upon success, (2) the most profitable type of ownership for various sizes of businesses, (3) optimum location in view of markets and transportation costs, (4) the optimum degree and type of diversification, (5) the best means of handling used equipment, (6) the potential for leasing farm equipment, (7) applicable techniques for smoothing out seasonality of business, (8) need for special training schools and fringe benefits to acquire competent labor, (9) the feasibility of terminating open account credit to customers, (10) benefits to be gained from advertising, (11) the importance of guarantees in conduct of the business, (12) the factors forcing dealers out of the business, (13) advantages and disadvantages of the various accounting systems, and (14) the effect of the federal farm programs upon farm equipment dealers.

# Appendix

## A. Mail Questionnaire

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### DEPARTMENT OF AGRICULTURAL ECONOMICS LOUISIANA AGRICULTURAL EXPERIMENT STATION LOUISIANA STATE UNIVERSITY

1. Name of Firm \_\_\_\_\_  
 (Address) \_\_\_\_\_ (Town or City) \_\_\_\_\_ (Parish) \_\_\_\_\_
2. What is the nature of your business?<sup>1</sup> (For example, feed, seed and fertilizer retail store, feed mixing, sawmill, grain elevator, canning plant, etc.) \_\_\_\_\_
3. How long has this firm or its predecessor been in business? \_\_\_\_\_
4. Present type of ownership (check one):  
 Private \_\_\_\_\_ Cooperative \_\_\_\_\_  
 Partnership \_\_\_\_\_ Corporation \_\_\_\_\_  
 Other (Specify) \_\_\_\_\_
5. Type of physical organization (check one):  
 Single plant \_\_\_\_\_ One of two or more in the state \_\_\_\_\_  
 Part of national chain \_\_\_\_\_ Other (Specify) \_\_\_\_\_
6. (a) Size of service area for this plant. (Fill in blanks below):  
 North \_\_\_\_\_ miles South \_\_\_\_\_ miles  
 East \_\_\_\_\_ miles West \_\_\_\_\_ miles  
 (b) Number of parishes served \_\_\_\_\_
7. What is the estimated replacement value of your facility? \_\_\_\_\_
8. Number of employees (Fill in appropriate blanks): \_\_\_\_\_

| Type                  | Permanent |        | Additional<br>for Seasonal Work |        |
|-----------------------|-----------|--------|---------------------------------|--------|
|                       | Male      | Female | Male                            | Female |
| Manager               |           |        |                                 |        |
| Office Workers        |           |        |                                 |        |
| Field Representatives |           |        |                                 |        |
| Servicemen            |           |        |                                 |        |
| Laborers              |           |        |                                 |        |
| Unskilled Operators   |           |        |                                 |        |
| Others                |           |        |                                 |        |

9. Volume of gross business during a typical year (Check opposite appropriate figure):  

|                 |       |                     |       |
|-----------------|-------|---------------------|-------|
| Under \$25,000  | _____ | 350,000- 399,999    | _____ |
| 25,000- 49,999  | _____ | 400,000- 449,999    | _____ |
| 50,000- 74,999  | _____ | 450,000- 499,999    | _____ |
| 75,000- 99,999  | _____ | 500,000- 599,999    | _____ |
| 100,000-124,999 | _____ | 600,000- 699,999    | _____ |
| 125,000-149,999 | _____ | 700,000- 799,999    | _____ |
| 150,000-174,999 | _____ | 800,000- 899,999    | _____ |
| 175,000-199,999 | _____ | 900,000- 999,999    | _____ |
| 200,000-249,999 | _____ | 1,000,000-1,499,999 | _____ |
| 250,000-299,999 | _____ | 1,500,000-1,999,999 | _____ |
| 300,000-349,999 | _____ | 2,000,000-over      | _____ |

<sup>1</sup>Note that the name of a firm does not always reflect the true nature of the business.

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## B. Interview Schedule

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#### DEPARTMENT OF AGRICULTURAL ECONOMICS LOUISIANA STATE UNIVERSITY

Date \_\_\_\_\_

Enumerator \_\_\_\_\_

Name of Firm \_\_\_\_\_

Address \_\_\_\_\_ Parish \_\_\_\_\_

Name and Title of Interviewee \_\_\_\_\_

##### I. Origin and Ownership

1. When did firm start in business? \_\_\_\_\_

2. (a) What was the original type of ownership, and what is it now?  
Orig. Now Reason for change

Single proprietorship \_\_\_\_\_

Partnership \_\_\_\_\_

Corporation \_\_\_\_\_

Other \_\_\_\_\_

Additional explanation \_\_\_\_\_

(b) Do you plan to change the type of organization? Yes \_\_\_\_\_ No \_\_\_\_\_  
Explain \_\_\_\_\_

3. Does your firm own or lease the following?  
Own Lease

Land \_\_\_\_\_ If leased, why? \_\_\_\_\_

Buildings \_\_\_\_\_

##### II. Physical Characteristics of Firms

1. Are you pleased with your present facilities? If not what would be desirable?  
Now Desired

Location \_\_\_\_\_

Size of office space \_\_\_\_\_ sq. ft. \_\_\_\_\_

Service and repairs \_\_\_\_\_ sq. ft. \_\_\_\_\_

Inside display \_\_\_\_\_ sq. ft. \_\_\_\_\_

Outside display \_\_\_\_\_ acres \_\_\_\_\_

Storage warehouses \_\_\_\_\_ sq. ft. \_\_\_\_\_

Comments \_\_\_\_\_

2. (a) What changes have you made in your facilities in the past 10 years? \_\_\_\_\_

(b) What changes do you plan to make in the next 5 years? \_\_\_\_\_

(c) In addition to farm machinery, do you sell other merchandise?  
Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, what percentage of your business may be attributed to each?

Farm machinery \_\_\_\_\_ Feed, seed, etc. \_\_\_\_\_

Trucks & autos \_\_\_\_\_ Miscellaneous \_\_\_\_\_

Hardware \_\_\_\_\_ Comments \_\_\_\_\_

Home appliances \_\_\_\_\_

Oil, fuel, etc. \_\_\_\_\_

##### III. Business and growth

1. List the parishes included in your service area \_\_\_\_\_

2. What percentage of your business may be attributed to sales \_\_\_\_\_;  
service \_\_\_\_\_; spare parts \_\_\_\_\_?

3. Do you lend or lease equipment to farmers? Yes\_\_\_\_\_ No\_\_\_\_\_
 

If yes, give details \_\_\_\_\_
4. (a) What percentage of your business is done on credit? \_\_\_\_\_
 

(b) What does your credit loss amount to per year? \_\_\_\_\_

(c) Do you provide open account credit? Yes\_\_\_\_\_ No\_\_\_\_\_

(d) How much open account credit is on the books from month to month? \_\_\_\_\_

(e) What is the total volume of credit extended from month to month? \_\_\_\_\_

(f) Do you follow any specific plan for collection of open accounts? \_\_\_\_\_

5. How much of your business may be attributed to sale of used equipment? \_\_\_\_\_%

6. Is this firm one of several joint enterprises? Yes\_\_\_\_\_ No\_\_\_\_\_

If yes, explain \_\_\_\_\_

7. Does zoning restrict your plant operation? Yes\_\_\_\_\_ No\_\_\_\_\_

If yes, explain \_\_\_\_\_

#### IV. Seasonality of Business

1. What percentage of your business is done during the following periods:

Jan. 1-Mar. 31\_\_\_\_\_

July 1-Sept. 30\_\_\_\_\_

Apr. 1-June 30\_\_\_\_\_

Oct. 1-Dec. 31\_\_\_\_\_

What practices have you introduced to smooth out seasonal fluctuations? \_\_\_\_\_

#### V. Management

1. Is this firm affiliated through ownership or management with other businesses in your service area? Yes\_\_\_\_\_ No\_\_\_\_\_ If yes, give number and types. No. \_\_\_\_\_. Types \_\_\_\_\_

2. If management is separate from ownership, what type of decisions does ownership have to approve? \_\_\_\_\_

And what incentives are offered to management to stimulate performance? \_\_\_\_\_

3. For planning and guidance, what trade journals are used? \_\_\_\_\_

What government reports? \_\_\_\_\_

What Exp. Station Publications? \_\_\_\_\_

Other \_\_\_\_\_

#### VI. Employment

1. Does your firm provide employees with:

Insurance plans \_\_\_\_\_

Hospitalization \_\_\_\_\_

Retirement pensions \_\_\_\_\_

Bonuses \_\_\_\_\_

Profit sharing \_\_\_\_\_

Paid vacations \_\_\_\_\_

Automatic salary raises and promotions \_\_\_\_\_

Other \_\_\_\_\_

2. Do you have labor union problems? \_\_\_\_\_

3. Labor turnover in the firm.

|                | No. regularly<br>employed<br>by the<br>firm |        | No. with you<br>this year that<br>were with you<br>last year |        | No. quit or<br>fired during<br>past year |        |
|----------------|---------------------------------------------|--------|--------------------------------------------------------------|--------|------------------------------------------|--------|
|                | Male                                        | Female | Male                                                         | Female | Male                                     | Female |
| Monthly salary | _____                                       | _____  | _____                                                        | _____  | _____                                    | _____  |
| Hourly wage    | _____                                       | _____  | _____                                                        | _____  | _____                                    | _____  |
| Part time      | _____                                       | _____  | _____                                                        | _____  | _____                                    | _____  |



## VII. Sales and Purchases

1. What per cent of your sales are made directly to:  
 Farmers \_\_\_\_\_ Government agencies \_\_\_\_\_  
 Industrial \_\_\_\_\_ Other retailers \_\_\_\_\_
2. What franchises does your firm have? \_\_\_\_\_
3. What is your purchasing floor plan? \_\_\_\_\_
4. Do manufacturers or sales representatives use pressure tactics to encourage higher inventories than is practical? \_\_\_\_\_
5. Do you discuss prices of new equipment with your competitors? \_\_\_\_\_  
 Used equipment? \_\_\_\_\_
6. What guarantees do you offer on:  
 (a) New machinery \_\_\_\_\_  
 (b) Used machinery \_\_\_\_\_  
 (c) Repairs \_\_\_\_\_
7. Do you use association accounting forms and follow the recommended accounting system? \_\_\_\_\_
8. What system of accounting do you use? \_\_\_\_\_
9. How are repairs and services to used equipment charged to the business?  
 \_\_\_\_\_  
 At list price or net price? \_\_\_\_\_
10. What is the usual discount from list price at which you obtain equipment?  
 \_\_\_\_\_. Does shipper pay the freight? \_\_\_\_\_
11. What per cent markup on sale items must you average to break even? \_\_\_\_\_
12. What dollar volume must you average annually to break even? \_\_\_\_\_
13. How much are you assessed for institutional advertising? \_\_\_\_\_
14. How much do you spend for additional advertising during the year? \_\_\_\_\_
15. Who is your supplier? \_\_\_\_\_

## VIII. Capital Requirements and Credit

1. (a) What is your total investment? (Resale value) \_\_\_\_\_  
 Allocate as to:  
 Land \_\_\_\_\_  
 Buildings \_\_\_\_\_  
 Vehicles, etc. \_\_\_\_\_  
 Average inventory \_\_\_\_\_  
 of salable \_\_\_\_\_  
 equipment \_\_\_\_\_  
 (b) What per cent return on capital invested do you try to attain? \_\_\_\_\_
2. Was investment capital borrowed to start or expand the firm? Yes \_\_\_\_\_  
 No \_\_\_\_\_. Give details.  

| Source        | Year  | Amount | Term  | Interest | Security |
|---------------|-------|--------|-------|----------|----------|
| Sold bonds    | _____ | _____  | _____ | _____    | _____    |
| Sold stock    | _____ | _____  | _____ | _____    | _____    |
| Comm. bank    | _____ | _____  | _____ | _____    | _____    |
| Gov't. agency | _____ | _____  | _____ | _____    | _____    |
3. Is operating capital normally borrowed? Yes \_\_\_\_\_ No \_\_\_\_\_. If yes indicate as above:  
 \_\_\_\_\_  
 Who is your strongest competitor? \_\_\_\_\_  
 What line does he sell? \_\_\_\_\_  
 Are you troubled by scalpers? \_\_\_\_\_  
 Do you add sales tax on sale of equipment? New \_\_\_\_\_ Used \_\_\_\_\_  
 Is it on list price or on sale price? \_\_\_\_\_

4. What credit do you provide for your customers? \_\_\_\_\_
  5. Do customers have difficulty obtaining credit? \_\_\_\_\_
  6. Are your account books audited periodically by someone outside the firm?  
\_\_\_\_\_ Why? \_\_\_\_\_
- IX. Government Programs and Farm Technology
1. Have federal farm programs affected your business appreciably? \_\_\_\_\_  
Explain \_\_\_\_\_
  2. Have technological changes on the farm affected your business appreciably?  
Explain \_\_\_\_\_
  3. How much do business licenses cost? Parish \_\_\_\_\_ City \_\_\_\_\_
- X. Miscellaneous
1. What is the normal volume of business done by your firm? \_\_\_\_\_  
What was the volume in 1960? \_\_\_\_\_, 1950 \_\_\_\_\_, 1940 \_\_\_\_\_.
  2. Are you aware of any specific problems facing farm equipment firms? \_\_\_\_\_
  3. What is the primary problem of the:  
(a) Parts Dept? \_\_\_\_\_  
(b) Service Dept? \_\_\_\_\_  
(c) Sales Dept.? \_\_\_\_\_
  4. What benefits do you realize from the Farm Equipment Associations? \_\_\_\_\_

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# COTTON VARIETY TESTS IN LOUISIANA 1957-61

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Bulletin No. 559  
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LOUISIANA STATE UNIVERSITY  
AND  
AGRICULTURAL AND MECHANICAL COLLEGE  
AGRICULTURAL EXPERIMENT STATION  
Charles W. Upp, Director

## SUMMARY

Averages of yield and other characteristics for cotton varieties and new strains tested at six locations in Louisiana during the 5-year period 1957-1961 are presented.

The over-all lint per acre averages of 13 varieties of cotton that were tested for 5 years show in a summary of experiments at Bossier City, St. Joseph, Lecompte and Baton Rouge that the highest yielding overall state-wide performing varieties are Stoneville 7, Stardel, Deltapine Smooth Leaf, Fox-4, Deltapine 15 and Stoneville 3202.

### Recommended Cotton Varieties for Louisiana

On the basis of results obtained, the following commercial varieties are recommended for Louisiana\*:

| <i>Northwestern</i> | <i>Northeastern</i> | <i>South Central</i> | <i>Southern</i> | <i>Northern</i> |
|---------------------|---------------------|----------------------|-----------------|-----------------|
| Stoneville 7        | Stoneville 7        | Stoneville 7         | Deltapine SL    | Fox-4           |
| Stardel             | Stardel             | Stardel              | Stardel         | Pope            |
| Fox-4               | Fox-4               | Fox-4                | Pope            | Deltapine SL    |
| Delfos 9169         | Deltapine SL        | Stoneville 3202      | Stoneville 7    | Plains          |
| Stoneville 3202     | Stoneville 3202     | Delfos 9169          | Fox-4           | Stoneville 7    |
| Empire              |                     | Deltapine SL         | Coker 100A-WR   | Stardel         |
| Deltapine SL**      |                     | Plains               | Plains          | Auburn 56**     |
| Rex**               |                     |                      |                 | Rex**           |

\*Deltapine 15 is being replaced commercially with Deltapine Smooth Leaf variety and Stoneville 7A replaced Stoneville 7 in 1962.

\*\*Estimated adjusted averages based upon 4 years of testing at Bossier City and 3 years testing at Homer.

### Cotton Varieties for Fusarium Wilt-Rootknot Nematode Problem Areas

Fusarium wilt-rootknot nematode complex causes severe damage to cotton in some areas of the state. It is particularly serious on the light sandy soils of the Red River valley and the interior coastal plain of North Louisiana. Where this disease is a problem, Fusarium wilt-resistant varieties should be planted. Resistant varieties ranked in order of decreasing yield on infested soil under Louisiana conditions are Auburn 56, Plains, Coker 100A-WR, Dixie King, and Empire.

For information on Fusarium wilt-rootknot nematode complex the reader is referred to Jones and Newsom, "Resistant Cotton for Wilt-Nematode Areas," *Louisiana Agriculture*, Vol. 3, Fall 1959.

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# Cotton Variety Tests in Louisiana, 1957-61

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## INTRODUCTION

New and leading commercial cotton varieties are tested each year in Louisiana. A 5-year summary is prepared in order that one may reliably compare the current behavior of varieties. Since cotton breeders are continually making improvements in commercial varieties and strains, tests are needed each year to determine these changes or trends and to make proper evaluation of them. Because of the nature of the cotton plant and the variable environmental conditions, the basis for recommendation includes only varieties that have been tested for 4 years and preferably a 5-year duration of experiments. This length of testing affords an opportunity to observe and interpret current variety behavior. Data for varieties that have been tested for fewer than 5 years are presented in Tables 2, 5, 8, 11, 14 and 17. The per acre yield of lint for years in which the varieties were grown are averaged, as well as an estimated comparable corrected average of lint yield for anyone who wishes to use this as an estimate of relative variety average production, assuming the varieties in the estimated comparison would have responded in a similar manner in the years they were not included in the experiment. Detailed results of varieties and new strains have been published in the preliminary mimeographed reports of the Department of Agronomy for 1957-1961.

## PROCEDURE FOR COTTON VARIETY TESTING IN LOUISIANA

Each test received the fertilizer treatment recommended for the area and normal cultivation for good crop growth. Each year cotton boll weevils and bollworms were present in sufficient numbers to require a regular cotton insect control program. In 1958 at Lecompte and in 1961 in the Homer test the boll weevil and bollworm populations were excessive during July and August. This probably was an important factor in reducing the over-all averages of the experiments for these years. It has also been noted that excessive rainfall during July and August frequently exerts a depressing effect upon total yield in cotton experiments.

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The yield of seed cotton was based on mean weights from five or six replications of plots approximately 100 feet in length at each location, with the exception of the mechanization tests at Bossier City, which were four replications, four rows wide and approximately 445 feet long. Lint percentage was determined by ginning two 100-boll samples for each variety on a small experimental saw gin. Hills were spaced 12-14 inches apart in the row, with two to three plants per hill.

The number of bolls required to produce a pound of seed cotton and the staple length measurements were also obtained from the two 100-boll samples from each variety. The grade and length determinations for the mechanization experiments at Bossier City were obtained from a gin sample of a regular commercial ginned bale of lint. The fiber length and grade classifications were made by Luther Rone and his associates of the Production and Marketing Administration Cotton Classing Office in Alexandria.

The seedbed preparation, fertilization, planting, cultivating and harvesting of the cotton variety tests located at the six experiment stations were supervised by J. Y. Oakes, J. A. Hendrix, J. G. Marshall, S. A. Phillips, C. R. Carter and F. W. Self. The authors are indebted to L. L. McCormick, D. R. Melville, E. K. Chandler, L. W. Sloane and R. N. Flint for their assistance in conducting these experiments.

The seed used in these cotton variety tests were obtained from the following:

|                   |                                                                       |
|-------------------|-----------------------------------------------------------------------|
| Acala 4-42        | California Planting Seed Distributors, Shafter, Cal.                  |
| Auburn 56         | Alabama Experiment Station, Auburn, Ala.                              |
| Coker 100A-WR,    |                                                                       |
| Coker 124         | Coker's Pedigreed Seed Co., Hartsville, S. C.                         |
| Delta Queen       | Coker's Pedigreed Seed Co., Hartsville, S. C.                         |
| Deltapine 15,     |                                                                       |
| Deltapine SL      | Delta and Pine Land Co., Scott, Miss.                                 |
| Deltapine M 8948  | USDA Delta Branch Expt. Station, Stoneville, Miss.                    |
| DES 1000 Strains  | USDA Delta Branch Expt. Station, Stoneville, Miss.                    |
| DeKalb 108 & 220  | DeKalb Agric. Assoc., Inc., P. O. Box 281, Bogart, Ga.                |
| Delfos 9169       | Stoneville Pedigreed Seed Co., Stoneville, Miss.                      |
| Dixie King        | Bobshaw Pedigreed Seed Co., Indianola, Miss.                          |
| Empire            | Empire Pedigreed Seed Co., P. O. Box 7, Haralson, Ga.                 |
| Fox-4             | Delta and Pine Land Co., Scott, Miss.                                 |
| Lankart 57        | Lankart Seed Farms, Waco, Texas                                       |
| La. DC 1959       | La. Agricultural Experiment Station, Baton Rouge, La.                 |
| La. 3314          | La. Agricultural Experiment Station, Baton Rouge, La.                 |
| Plains            | Alabama Experiment Station, Auburn, Ala.                              |
| Pope              | Tennessee Agric. Expt. Station, Knoxville, Tenn.                      |
| Rex               | Arkansas Agric. Expt. Station, Marianna, Ark.                         |
| Stardel           | La. Agricultural Experiment Station, Baton Rouge, La.                 |
| Stoneville 7, 7A, |                                                                       |
| 213 & 3202        | Stoneville Pedigreed Seed Co., Stoneville, Miss.                      |
| Wescot            | Texas Agricultural Experiment Station, Sub-station 15, Weslaco, Texas |

## Results From Variety Tests

The mean yields of the varieties at each station are summarized in Tables 2, 5, 8, 11, 14 and 17.

Tables 3, 6, 9, 12 and 15 present summaries of many yields for the varieties during the years grown and estimated comparable yields or relative mean lint yields of varieties that were not included each year. A method of making an estimated comparable yield of varieties which were tested less than the 5-year summary period is illustrated at the bottoms of Tables 3, 6, 9, 12 and 15. A correction factor for each test was obtained from the mean yields of the varieties grown in the 5 observed years. The correction factor\* was obtained from the following equation:  $X-XY=C$ , where X is the grand average of varieties that have been included every year in the period of years summary, XY is the mean of the Yth year, and C is the correction factor. The correction factor for each year was then added, algebraically, to the yield values for all varieties within that year. This gives a set of estimated comparable yields, as is shown in Tables 3, 6, 9, 12 and 15.

The estimated\*\* state average acre yields of lint in Louisiana for the past 5 years, by years for the period 1957-1961, were as follows: 380, 378, 476, 470 and 458 pounds. The general trend in Louisiana continues to be toward more lint per acre on fewer acres.

### SOUTH LOUISIANA TESTS

F. W. SELF

#### Cotton Variety Averages of Tests, 1957-1961, Baton Rouge, La.

The variety tests were conducted at the Perkins Road farm of the Louisiana Agricultural Experiment Station 3 miles east of Baton Rouge. They were on Foley silt loam in 1957 through 1959 and on Olivier silt loam in 1960 and 1961. The cotton received 600 pounds of 8-8-8 mixed fertilizer with 100 pounds of sodium nitrate as a side dressing, 1957 through 1960, and in 1961 it received 700 pounds of 8-8-8 mixed fertilizer. Cotton followed corn each year in a rotation.

The tests were planted on May 13, 1957; May 13, 1958; April 28, 1959; May 12, 1960; and April 24, 1961. The hills were spaced approximately 14 inches apart in the row with two to three plants per hill.

East Baton Rouge Parish receives annually, as an average, 59.29 inches of rainfall. Thirty and forty hundredths inches of rainfall, as an average, falls from April through September. According to the U. S. weather records, Baton Rouge received 30.69 inches in 1957, 24.68 inches in 1958, 35.01 inches in 1959, 23.31 inches in 1960 and 35.27 inches in 1961 from April through September.

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\*Patterson, R. E. "A Method of Adjusting for Calculating Comparable Yields in Variety Tests", *Agronomy Journal*, 42:509-511, 1950.

\*\*"The Cotton Situation," United States Department of Agriculture. Agricultural Marketing Service.

TABLE 1.—Rainfall data, Baton Rouge, La., 1957-1961

| Year                | April | May  | June | July  | Aug. | Sept. | April-Sept.<br>Departure<br>From Mean |
|---------------------|-------|------|------|-------|------|-------|---------------------------------------|
| 1957                | 6.08  | 2.67 | 4.56 | 7.30  | 3.60 | 6.48  | + .29                                 |
| 1958                | 4.14  | 3.03 | 4.58 | 5.08  | 4.53 | 3.32  | —5.72                                 |
| 1959                | 3.26  | 8.91 | 4.14 | 10.11 | 5.38 | 3.21  | +4.61                                 |
| 1960                | 2.18  | 4.28 | 0.81 | 5.50  | 9.37 | 1.17  | —7.09                                 |
| 1961                | 4.65  | 3.80 | 3.67 | 10.94 | 2.54 | 9.67  | +4.87                                 |
| Monthly<br>average* | 4.50  | 4.92 | 5.02 | 5.87  | 5.77 | 4.32  |                                       |

\*U.S. Weather Bureau long-term mean.



TABLE 2.—Five-year averages of 13 cotton varieties tested on the Louisiana Agricultural Experiment Station, Perkins Road Farm, Baton Rouge, La., 1957-1961

| Variety                                 | Pounds of lint per acre |      |      |      |      | 5-year averages  |                  |                               |                                   |
|-----------------------------------------|-------------------------|------|------|------|------|------------------|------------------|-------------------------------|-----------------------------------|
|                                         | 1957                    | 1958 | 1959 | 1960 | 1961 | Lint<br>per acre | Lint<br>per cent | Staple<br>length,<br>in 1/32" | Bolls<br>per pound<br>seed cotton |
| Deltapine Smooth Leaf                   | 552                     | 798  | 759  | 948  | 902  | 794              | 39.0             | 34.0                          | 79                                |
| Stardel                                 | 496                     | 799  | 753  | 877  | 826  | 750              | 38.1             | 34.4                          | 77                                |
| Pope                                    | 914                     | 991  | 617  | 724  | 489  | 747              | 39.4             | 33.4                          | 79                                |
| Stoneville 7                            | 609                     | 699  | 621  | 988  | 792  | 742              | 37.7             | 34.2                          | 79                                |
| Deltapine 15                            | 515                     | 821  | 784  | 795  | 765  | 786              | 38.5             | 34.6                          | 81                                |
| Fox-4                                   | 514                     | 781  | 644  | 930  | 683  | 710              | 38.6             | 34.6                          | 76                                |
| Coker 100A-WR                           | 485                     | 769  | 445  | 1027 | 751  | 695              | 37.3             | 33.8                          | 75                                |
| Plains                                  | 451                     | 871  | 534  | 940  | 581  | 675              | 39.9             | 34.0                          | 71                                |
| Stoneville 3202                         | 500                     | 674  | 631  | 856  | 674  | 675              | 38.0             | 33.6                          | 80                                |
| Empire                                  | 872                     | 670  | 579  | 784  | 446  | 670              | 33.5             | 33.8                          | 65                                |
| Dixie King                              | 895                     | 559  | 409  | 861  | 531  | 651              | 33.9             | 34.0                          | 65                                |
| Deltos 9169                             | 426                     | 504  | 562  | 979  | 653  | 625              | 33.9             | 34.8                          | 66                                |
| Rex                                     | 769                     | 579  | 428  | 794  | 316  | 577              | 36.2             | 33.4                          | 71                                |
| Mean lint per acre                      | 615                     | 732  | 597  | 885  | 651  | 696              |                  |                               |                                   |
| Difference required for<br>significance | 100                     | 127  | 145  | 138  | 135  | 75               |                  |                               |                                   |

TABLE 3.—Mean by years and estimated adjusted average acre yield of lint of cotton varieties tested 2-4 years, on the Louisiana Agricultural Experiment Station Perkins Road Farm, Baton Rouge, La., 1957-1961

| Variety              | Pounds of lint per acre |      |      |       |      | Adjusted* average | Lint per cent | Staple length in 1/32" | Bolls per pound seed cotton |
|----------------------|-------------------------|------|------|-------|------|-------------------|---------------|------------------------|-----------------------------|
|                      | 1957                    | 1958 | 1959 | 1960  | 1961 |                   |               |                        |                             |
| Correction factors   | + 81                    | — 36 | + 99 | — 189 | + 45 |                   |               |                        |                             |
| Deltapine M8948      | ...                     | ...  | 764  | 938   | 851  | 810               | 39.2          | 34.0                   | 81                          |
| Stoneville 7-A       | 633                     | 776  | 762  | 777   | 748  | 786               | 39.1          | 35.0                   | 82                          |
| La. 3314             | 625                     | 893  | 625  | 946   | 775  | 777               | 38.2          | 33.5                   | 73                          |
| DES 1000 strain      | ...                     | ...  | 649  | 900   | 676  | 764               | 39.6          | 33.8                   | 80                          |
| Auburn 56            | ...                     | ...  | 600  | 910   | 624  | 716               | 36.4          | 34.5                   | 73                          |
| Wescot               | ...                     | ...  | 584  | 880   | 697  | 713               | 38.3          | 34.0                   | 71                          |
| DeKalb 108           | ...                     | ...  | 584  | 928   | ...  | 711               | 36.6          | 34.7                   | 68                          |
| Stoneville 3202-4302 | ...                     | ...  | 540  | 938   | ...  | 711               | 38.5          | 35.0                   | 82                          |
| DeKalb 220           | ...                     | ...  | 540  | 938   | 682  | 705               | 37.1          | 34.3                   | 71                          |
| Coker 124            | 429                     | 724  | 932  | ...   | ...  | 661               | 36.1          | 34.7                   | 73                          |

\*Estimated adjusted mean yields. The average yield of Deltapine M8948, for example, was obtained as follows: (764 + 99) + (861 - 189) + (851 + 45)/3 = 810.

# NORTHEAST LOUISIANA TESTS

J. A. HENDRIX

## Cotton Variety and New Strains Averages of Tests, 1957-61 St. Joseph, Louisiana

The variety tests were conducted on the Northeast Louisiana Experiment Station located approximately 3 miles north of St. Joseph. The soil in the test area was Commerce silt loam of dark brownish gray Mississippi River bottom phase. The cotton variety tests were rotated so as to follow corn and soybeans in a 3-year rotation. Nitrogen was applied to the test each year before bedding the rows for planting. Ammonium nitrate was used as the source of nitrogen. The tests received 80 pounds of nitrogen in 1957, 60 pounds in 1958, 60 pounds in 1959, 70 pounds in 1960 and 86 pounds in 1961.

The tests were planted on May 7, 1957; April 24, 1958; April 30, 1959; May 10, 1960 and May 3, 1961.

St. Joseph receives, as an average, 21.68 inches of rainfall of its annual 53.86 total inches during the 6 months, April through September. According to the U. S. weather records, in 1957 the rainfall was approximately 7.10 inches above average; in 1958, 5.12 inches above average; in 1959, 9.34 inches above average; in 1960, 5.79 inches below average and in 1961, 1.29 inches below average during the April-September period.

TABLE 4.—Rainfall data, St. Joseph, La., 1957-1961

| Year                | April | May  | June | July | Aug. | Sept. | April-Sept.<br>Departure<br>From Mean |
|---------------------|-------|------|------|------|------|-------|---------------------------------------|
| 1957                | 4.04  | 4.12 | 8.55 | 4.98 | 1.52 | 5.57  | +7.10                                 |
| 1958                | 4.85  | 2.62 | 7.27 | 2.21 | 4.64 | 5.21  | +5.12                                 |
| 1959                | 4.00  | 3.20 | 9.72 | 5.88 | 4.10 | 4.12  | +9.34                                 |
| 1960                | 1.28  | 2.62 | 2.21 | 1.76 | 7.32 | 0.70  | -5.79                                 |
| 1961                | 2.93  | 1.38 | 6.97 | 4.99 | 2.26 | 1.86  | -1.29                                 |
| Monthly*<br>average | 2.56  | 5.38 | 3.33 | 4.99 | 3.18 | 2.24  |                                       |

\*U.S. Weather Bureau long-term mean.

Stoneville 7, Stardel, Fox-4 and Deltapine Smooth Leaf were the leading varieties, based on an average of the thirteen varieties in the 5-year comparison.

TABLE 5.—Five-year averages of 13 cotton varieties tested on the Northeast Louisiana Agricultural Experiment Station, St. Joseph, La., 1957-1961

| Variety                              | Pounds of lint per acre |      |      |      |      | 5-year averages |               |                                                    |
|--------------------------------------|-------------------------|------|------|------|------|-----------------|---------------|----------------------------------------------------|
|                                      | 1957                    | 1958 | 1959 | 1960 | 1961 | Lint per acre   | Lint per cent | Staple length in 1/32" Bolls per pound seed cotton |
| Stoneville 7                         | 815                     | 769  | 1045 | 1266 | 1151 | 1009            | 38.8          | 34.8 77                                            |
| Stardel                              | 826                     | 865  | 951  | 1162 | 1170 | 995             | 39.1          | 34.8 79                                            |
| Fox-4                                | 901                     | 706  | 1005 | 1183 | 1109 | 981             | 38.1          | 34.6 74                                            |
| Delapine Smooth Leaf                 | 861                     | 849  | 924  | 1207 | 984  | 965             | 39.7          | 34.4 76                                            |
| Delapine 15                          | 923                     | 776  | 900  | 1147 | 931  | 935             | 39.8          | 35.0 74                                            |
| Stoneville 3202                      | 771                     | 722  | 861  | 1163 | 1151 | 934             | 38.1          | 33.6 78                                            |
| Pope                                 | 827                     | 573  | 919  | 957  | 1178 | 891             | 39.6          | 33.8 73                                            |
| Plains                               | 700                     | 729  | 894  | 1009 | 997  | 866             | 36.6          | 34.4 68                                            |
| Delfos 9169                          | 664                     | 688  | 830  | 1114 | 875  | 834             | 35.4          | 35.8 66                                            |
| Dixie King                           | 643                     | 637  | 905  | 974  | 960  | 824             | 36.8          | 34.6 62                                            |
| Coker 100A-WR                        | 627                     | 660  | 856  | 1073 | 852  | 814             | 37.3          | 35.2 77                                            |
| Rex                                  | 464                     | 589  | 932  | 986  | 914  | 777             | 36.2          | 34.4 70                                            |
| Empire                               | 669                     | 550  | 712  | 872  | 955  | 752             | 35.1          | 34.8 60                                            |
| Mean lint per acre                   | 746                     | 701  | 900  | 1086 | 1017 | 890             |               |                                                    |
| Difference required for significance | 94                      | 72   | 112  | 79   | 129  | 72              |               |                                                    |

TABLE 6.—Mean by years and estimated adjusted average acre yield of lint of cotton varieties tested 2-4 years on the Northeast Louisiana Experiment Station, St. Joseph, La., 1957-1961

| Variety           | Pounds of lint per acre |      |      |       |       | Average           |               |                                                    |
|-------------------|-------------------------|------|------|-------|-------|-------------------|---------------|----------------------------------------------------|
|                   | 1957                    | 1958 | 1959 | 1960  | 1961  | Adjusted* average | Lint per cent | Staple length in 1/32" Bolls per pound seed cotton |
| Correction factor | +144                    | +189 | - 10 | - 196 | - 127 |                   |               |                                                    |
| Auburn 56         | ...                     | ...  | ...  | 1191  | 1004  | 936               | 36.5          | 34.5 68                                            |
| DES 1000 strains  | 764                     | 761  | 917  | 1155  | ...   | 931               | 40.7          | 34.3 77                                            |
| Coker 124         | 731                     | ...  | ...  | 1153  | 1074  | 926               | 37.2          | 35.3 70                                            |
| Acala 4-42        | ...                     | ...  | ...  | 971   | 797   | 723               | 38.1          | 34.5 62                                            |
| Lankart 57        | ...                     | ...  | ...  | 867   | 540   | 542               | 37.9          | 33.4 49                                            |

\*Estimated adjusted mean yields. The average adjusted yield of Auburn 56, for example, was obtained as follows:  $(1191-196) + (1004-127) / 2 = 936$ .

# SOUTH CENTRAL LOUISIANA TESTS

J. G. MARSHALL

## Cotton Variety Averages of Tests, 1957-61, Lecompte, La.

The tests at Lecompte were located on the Louisiana Agricultural Experiment Station approximately 15 miles south of Alexandria. They were planted on very fine sandy loam and silt loam of the Yahola series of the Red River bottom. The tests received a mixed fertilizer of 72 pounds of nitrogen, 48 pounds of phosphorus and 48 pounds of potash each year.

The tests were planted on May 17, 1957; April 16, 1958; April 30, 1959; April 26, 1960; and May 5, 1961.

The Alexandria area receives, as an average, 58.37 inches of rainfall annually, 27.28 inches of which falls during the 6-month period of April through September. According to the U.S. weather records, the area received 1.53 inches above normal in 1957; 6.17 inches above normal in 1958; 4.82 inches below normal in 1959; 0.65 inches below normal in 1960 and 5.33 inches above normal in 1961 during the April-September period.

**TABLE 7.—Rainfall data, Alexandria, La., 1957-1961**

| Year                | April | May  | June | July | Aug. | Sept. | April-Sept.<br>Departure<br>From Mean |
|---------------------|-------|------|------|------|------|-------|---------------------------------------|
| 1957                | 5.91  | 3.19 | 9.08 | 4.96 | 0.29 | 5.38  | +1.53                                 |
| 1958                | 6.30  | 1.80 | 4.44 | 3.22 | 7.41 | 10.28 | +6.17                                 |
| 1959                | 5.37  | 3.05 | 3.89 | 5.27 | 2.50 | 2.38  | -4.82                                 |
| 1960                | 2.25  | 4.94 | 4.66 | 4.08 | 7.29 | 3.41  | -0.65                                 |
| 1961                | 1.96  | 6.16 | 8.85 | 6.45 | 6.26 | 2.93  | +5.33                                 |
| Monthly*<br>average | 5.88  | 5.58 | 4.03 | 5.21 | 3.42 | 3.16  |                                       |

\*U.S. Weather Bureau long-term mean.

Stoneville 7, Stardel, Fox-4 and Stoneville 3202, Delfos 9169, Delta-pine Smooth Leaf and Plains were the leading varieties in the 5 year summary of experiments.



TABLE 8.—Five-year averages of 14 cotton varieties tested on the Louisiana Agricultural Experiment Station, Lecompte, Louisiana, 1957-61

| Variety                                 | Pounds of lint per acre |      |      |      |      | Lint<br>per acre | Lint<br>per cent | Staple<br>length<br>in 1/32" | Bolls per<br>pound seed<br>cotton |
|-----------------------------------------|-------------------------|------|------|------|------|------------------|------------------|------------------------------|-----------------------------------|
|                                         | 1957                    | 1958 | 1959 | 1960 | 1961 |                  |                  |                              |                                   |
| Stoneville 7                            | 1076                    | 582  | 1078 | 1395 | 976  | 1021             | 38.8             | 34.0                         | 79                                |
| Stardel                                 | 1120                    | 604  | 1080 | 1197 | 922  | 985              | 39.2             | 34.2                         | 81                                |
| Fox-4                                   | 1076                    | 634  | 1046 | 1241 | 930  | 985              | 37.6             | 33.8                         | 78                                |
| Stoneville 3202                         | 1064                    | 577  | 971  | 1323 | 949  | 977              | 38.5             | 33.6                         | 77                                |
| Delfos 9169                             | 969                     | 627  | 1065 | 1376 | 846  | 977              | 36.2             | 35.2                         | 68                                |
| Deltapine 15                            | 961                     | 615  | 1036 | 1423 | 777  | 962              | 39.6             | 34.2                         | 80                                |
| Deltapine Smooth Leaf                   | 971                     | 628  | 1128 | 1197 | 855  | 956              | 39.1             | 34.0                         | 79                                |
| Plains                                  | 975                     | 609  | 1107 | 1132 | 777  | 920              | 37.1             | 33.8                         | 70                                |
| Dixie King                              | 914                     | 527  | 965  | 1317 | 849  | 914              | 36.9             | 33.6                         | 61                                |
| Rex                                     | 861                     | 498  | 965  | 1187 | 989  | 900              | 37.1             | 34.0                         | 69                                |
| Louisiana 3314                          | 1164                    | 659  | 1172 | 814  | 676  | 897              | 39.3             | 33.8                         | 79                                |
| Coker 100A-WR                           | 914                     | 623  | 1005 | 1125 | 767  | 887              | 36.5             | 34.4                         | 74                                |
| Empire                                  | 730                     | 494  | 1060 | 1286 | 822  | 878              | 36.3             | 34.2                         | 62                                |
| Pope                                    | 1031                    | 436  | 1036 | 964  | 802  | 854              | 39.3             | 33.2                         | 78                                |
| Mean lint per acre                      | 988                     | 579  | 1051 | 1212 | 852  | 936              |                  |                              |                                   |
| Difference required for<br>significance | 152                     | 110  | N.S. | 160  | 98   | 103              |                  |                              |                                   |

TABLE 9.—Mean by years and estimated adjusted\* average acre yield of lint of cotton varieties tested 2-4 years on the Louisiana Agricultural Experiment Station, Lecompte, La., 1957-1961

| Variety                | Pounds of lint per acre |       |       |       |      | Adjusted*<br>average | Lint<br>per cent | Staple<br>length<br>in 1/32" | Bolls per<br>pound seed<br>cotton |
|------------------------|-------------------------|-------|-------|-------|------|----------------------|------------------|------------------------------|-----------------------------------|
|                        | 1957                    | 1958  | 1959  | 1960  | 1961 |                      |                  |                              |                                   |
| Correction factor      | - 51                    | + 356 | - 114 | - 275 | + 84 |                      |                  |                              |                                   |
| Stoneville 7-A (54206) | ...                     | ...   | 1135  | 1509  | 905  | 1111                 | 38.9             | 34.5                         | 72                                |
| Deltapine M8948        | ...                     | ...   | 1096  | 1703  | 901  | 1011                 | 39.2             | 34.3                         | 78                                |
| DES 1000               | 1051                    | 616   | ...   | 1285  | ...  | 991                  | 40.6             | 33.5                         | 81                                |
| Auburn 56              | ...                     | ...   | ...   | 1288  | 856  | 977                  | 35.9             | 34.0                         | 69                                |
| Coker 124              | 859                     | 630   | 1028  | 1235  | ...  | 917                  | 36.5             | 34.3                         | 72                                |
| La. DC-1959            | ...                     | ...   | ...   | 1125  | 783  | 859                  | 38.7             | 34.0                         | 76                                |

\* Estimated adjusted mean yields. The average adjusted yield of Stoneville 7-A (54206), for example, was obtained as follows:  
(1509-275) + (905 + 84)/2 = 1111.

# NORTHWEST LOUISIANA TESTS

J. Y. OAKES

## Cotton Variety Averages of Tests 1957-1961, Bossier City, La.

The tests at Curtis were conducted on the Red River Valley Experiment Station approximately 8 miles south of Bossier City, on Yahola very fine sandy loam Red River bottom soil. The tests received 60 pounds of nitrogen each year from anhydrous ammonia. Cotton followed cotton each year except in 1957 when it followed soybeans.

The tests were planted on May 6, 1957; May 13, 1958; April 30, 1959; May 4, 1960; and May 8, 1961.

The Bossier City area receives annually, as an average, 45.10 inches of rainfall, approximately 19.97 inches of which falls during the 6-month period of April through September. According to the U. S. weather records, the area received 12.22 inches above average in 1957; 12.49 inches above average in 1958; 2.75 inches below average in 1959; 3.50 inches above average in 1960 and 7.54 inches above average in 1961 for the months April through September.

TABLE 10.—Rainfall data, Bossier City, La., 1957-1961

| Year                | April | May  | June  | July | Aug. | Sept. | April-Sept.<br>Departure<br>From Mean |
|---------------------|-------|------|-------|------|------|-------|---------------------------------------|
| 1957                | 11.19 | 3.45 | 8.37  | 3.26 | 1.75 | 4.17  | +12.22                                |
| 1958                | 7.78  | 2.89 | 6.86  | 4.13 | 2.22 | 8.58  | +12.49                                |
| 1959                | 3.58  | 3.23 | 3.35  | 3.29 | 2.13 | 1.64  | - 2.75                                |
| 1960                | 1.39  | 1.88 | 7.35  | 2.88 | 4.99 | 4.98  | + 3.50                                |
| 1961                | 1.70  | 1.46 | 12.39 | 3.95 | 2.26 | 5.75  | + 7.54                                |
| Monthly*<br>average | 4.59  | 4.55 | 2.64  | 3.70 | 2.37 | 2.12  |                                       |

\*U.S. Weather Bureau long-term mean.

Stoneville 7, Stardel, Fox-4, Delfos 9169, Stoneville 3202 and Empire were the leading varieties in the 5-year summary. The 4-year estimated average of experiments with Deltapine Smooth Leaf and Rex indicated that these two varieties probably will yield lint averages equal to the other six varieties.

TABLE 11.—Five year averages of 11 cotton varieties tested on the Red River Valley Agricultural Experiment Station at Bossier City, La., 1957-1961

| Variety                              | Pounds of lint per acre |      |      |      |      | 5-year averages |               |                        |                             |
|--------------------------------------|-------------------------|------|------|------|------|-----------------|---------------|------------------------|-----------------------------|
|                                      | 1957                    | 1958 | 1959 | 1960 | 1961 | Lint per acre   | Lint per cent | Staple length in 1/32" | Bolls per pound seed cotton |
| Stoneville 7                         | 924                     | 768  | 1107 | 1114 | 844  | 951             | 38.3          | 33.8                   | 80                          |
| Stardel                              | 1008                    | 896  | 1120 | 942  | 733  | 940             | 39.2          | 34.2                   | 83                          |
| Fox-4                                | 956                     | 815  | 1055 | 949  | 796  | 914             | 37.9          | 33.8                   | 80                          |
| Delfos 9169                          | 959                     | 824  | 1120 | 905  | 744  | 910             | 35.3          | 34.6                   | 69                          |
| Deltapine 15                         | 927                     | 815  | 1060 | 910  | 732  | 889             | 39.8          | 33.8                   | 78                          |
| Stoneville 3202                      | 973                     | 744  | 1051 | 830  | 816  | 883             | 38.3          | 33.4                   | 78                          |
| Empire                               | 871                     | 773  | 1088 | 856  | 662  | 850             | 35.6          | 34.2                   | 64                          |
| Coker 100A-WR                        | 804                     | 866  | 996  | 877  | 639  | 836             | 37.0          | 34.2                   | 76                          |
| Dixie King                           | 854                     | 806  | 1019 | 793  | 632  | 821             | 36.6          | 34.0                   | 64                          |
| Plains                               | 777                     | 795  | 1097 | 825  | 553  | 809             | 37.0          | 33.6                   | 72                          |
| Pope                                 | 773                     | 621  | 981  | 805  | 794  | 795             | 38.9          | 33.4                   | 77                          |
| Mean lint per acre                   | 893                     | 793  | 1063 | 891  | 722  | 873             |               |                        |                             |
| Difference required for significance | 166                     | 72   | 127  | 137  | 115  | N.S.*           |               |                        |                             |

\*Not significant.

TABLE 12.—Mean lint by years and estimated adjusted average acre yield of lint of cotton varieties tested 2-4 years on the Red River Valley Agricultural Experiment Station, Bossier City, La., 1957-1961

| Variety               | Pounds of lint per acre |      |      |      |      | Average |                   |               |                        |
|-----------------------|-------------------------|------|------|------|------|---------|-------------------|---------------|------------------------|
|                       | 1957                    | 1958 | 1959 | 1960 | 1961 | Average | Adjusted* average | Lint per cent | Staple length in 1/32" |
| Correction factor     | -20                     | +80  | -191 | -19  | +150 |         |                   |               |                        |
| DES 1000 strains      | 990                     | 895  | 1114 | 1022 | ...  | 1005    | 977               | 40.3          | 33.0                   |
| Deltapine Smooth Leaf | ...                     | 838  | 1130 | 1003 | 834  | 951     | 956               | 39.7          | 33.8                   |
| Rex                   | ...                     | 889  | 1227 | 906  | 716  | 935     | 940               | 36.5          | 34.0                   |

\*Estimated adjusted mean yields. The adjusted average yield of Deltapine Smooth Leaf, for example, was obtained as follows:  
 $(838 + 80) + (1130 - 191) + (1003 - 19) + (834 + 150)/4 = 956.$

# NORTH LOUISIANA HILL FARM EXPERIMENT STATION TESTS

C. R. CARTER

## Cotton Variety Averages of Tests, Homer, La.

The tests at Homer were conducted on the North Louisiana Hill Farm Experiment Station approximately 3 miles south of Homer. They were on Ruston fine sandy loam in 1957 and 1958, a local alluvial sandy loam in 1959 and 1960, and a Shubuta fine sandy loam in 1961.

The tests received 500 pounds of 3-12-12 fertilizer at planting time with a side dressing of 300 pounds of ammonium nitrate in 1957; 800 pounds of 8-8-8 fertilizer with 108 pounds of ammonium nitrate in 1958; 500 pounds of 3-12-12 and 300 pounds of ammonium nitrate in 1959; 400 pounds of 3-12-12 fertilizer with 500 pounds of sodium nitrate in 1960 and 500 pounds of 3-12-12 and 210 pounds of ammonium nitrate per acre in 1961.

The Homer area receives, as an average, 52.68 inches of rainfall, 27.10 inches of which falls during the period of April through September. According to the station weather records, the area received during this period 7.99 inches above normal in 1957; 15.16 inches above normal in 1958; 3.10 inches above normal in 1959; 6.28 inches below normal in 1960 and 7.03 inches above normal in 1961.

TABLE 13.—Rainfall data, North Louisiana Hill Farm Experiment Station, Homer, La., 1957-1961

| Year                | April | May  | June  | July | Aug. | Sept. | April-Sept.<br>Departure<br>From Mean |
|---------------------|-------|------|-------|------|------|-------|---------------------------------------|
| 1957                | 10.55 | 8.90 | 7.52  | 2.92 | 0.82 | 4.38  | + 7.99                                |
| 1958                | 11.73 | 6.28 | 5.09  | 5.24 | 4.04 | 9.88  | +15.16                                |
| 1959                | 4.30  | 6.05 | 7.37  | 5.66 | 3.17 | 3.65  | + 3.10                                |
| 1960                | 2.67  | 3.51 | 5.60  | 1.88 | 5.93 | 1.23  | - 6.28                                |
| 1961                | 1.73  | 2.59 | 10.31 | 8.34 | 5.75 | 5.41  | + 7.03                                |
| Monthly*<br>average | 5.99  | 5.54 | 4.95  | 4.32 | 2.93 | 3.37  |                                       |

\*North Louisiana Hill Farm Experiment Station long-term mean.

The variety average results for the 5 years of experiments do not differ significantly in yield of lint per acre, except in 1961, when test averages were very low. In light of the fact that the difference in yield of lint per acre in 4 years of the 5 was non-significant, these variety averages were not considered in state-wide comparison. Stoneville 7, Plains, Fox-4, Dixie King, Pope, Deltapine Smooth Leaf, Stardel and Coker 100A-WR produced above average yields in a 5-year summary of the experiments. Three-year estimated adjusted averages indicate that Auburn 56, La. DC-1959 and Rex will probably produce above average yields of lint per acre at this station.



TABLE 14.—Five-year averages of 12 cotton varieties tested on the North Louisiana Hill Farm Agricultural Experiment Station at Homer, La., 1957-1961

| Variety                              | Pounds of lint per acre |       |       |       |      | 5-year averages |               |                                                    |
|--------------------------------------|-------------------------|-------|-------|-------|------|-----------------|---------------|----------------------------------------------------|
|                                      | 1957                    | 1958  | 1959  | 1960  | 1961 | Lint per acre   | Lint per cent | Staple length in 1/32" Bolls per pound seed cotton |
| Fox-4                                | 647                     | 879   | 1003  | 576   | 237  | 674             | 37.2          | 33.7 82                                            |
| Pope                                 | 682                     | 669   | 970   | 674   | 262  | 651             | 39.8          | 33.3 80                                            |
| Deltapine Smooth Leaf                | 751                     | 743   | 850   | 554   | 227  | 645             | 39.6          | 33.7 84                                            |
| Plains                               | 607                     | 944   | 868   | 552   | 268  | 642             | 37.6          | 34.0 75                                            |
| Stoneville 7                         | 689                     | 795   | 816   | 782   | 209  | 638             | 39.1          | 33.7 84                                            |
| Stardel                              | 652                     | 834   | 820   | 571   | 201  | 616             | 38.5          | 34.0 85                                            |
| Coker 100A-WR                        | 594                     | 924   | 715   | 521   | 209  | 593             | 37.4          | 33.5 79                                            |
| Stoneville 3202                      | 617                     | 749   | 882   | 560   | 144  | 590             | 38.3          | 32.8 87                                            |
| Deltapine 15                         | 654                     | 736   | 827   | 527   | 199  | 589             | 39.7          | 34.0 83                                            |
| Delfos 9169                          | 634                     | 835   | 742   | 550   | 162  | 575             | 36.0          | 34.0 71                                            |
| Empire                               | 621                     | 754   | 760   | 495   | 158  | 558             | 37.1          | 33.7 66                                            |
| Dixie King                           | 600                     | 886   | 815   | 597   | 203  | 520             | 36.2          | 33.7 68                                            |
| Mean lint per acre                   | 646                     | 812   | 847   | 567   | 207  | 616             |               |                                                    |
| Difference required for significance | N.S.*                   | N.S.* | N.S.* | N.S.* | 59   | N.S.*           |               |                                                    |

\*Not significant.

TABLE 15.—Mean lint by years and adjusted acre yield of lint cotton of varieties tested less than 4 years on the North Louisiana Hill Farm Experiment Station, Homer, La., 1957, 1958, 1960 and 1961

| Variety           | Pounds of lint per acre |       |      |      | Adjusted* average | Average       |                                                    |
|-------------------|-------------------------|-------|------|------|-------------------|---------------|----------------------------------------------------|
|                   | 1957                    | 1958  | 1960 | 1961 |                   | Lint per cent | Staple length in 1/32" Bolls per pound seed cotton |
| Correction factor | - 88                    | - 254 | - 9  | +351 |                   |               |                                                    |
| Auburn 56         | ...                     | 1032  | 747  | 266  | 711               | 36.9          | 33.7 78                                            |
| La. DC-1959       | ...                     | ...   | 743  | 216  | 628               | 38.6          | 34.0 82                                            |
| Rex               | ...                     | 958   | 583  | 172  | 600               | 37.0          | 33.7 75                                            |
| DES strains       | 740                     | 884   | 632  | ...  | 591               | 40.9          | 32.6 82                                            |
| Coker 124         | 590                     | 850   | 616  | ...  | 566               | 37.3          | 34.0 72                                            |
| La. 3314          | 661                     | 811   | ...  | 191  | 520               | 38.8          | 33.5 81                                            |

\*Estimated adjusted mean yields. The average adjusted yields of Auburn 56, for example, was obtained as follows: (1032 - 254) + (747 - 9) + (266 + 351)/3 = 711.

# MACON RIDGE EXPERIMENT STATION TESTS

S. A. PHILLIPS

## Cotton Variety Averages of Tests, 1960-1961, Winnsboro, La.

The tests at Winnsboro were conducted on Macon Ridge Experiment Station approximately 4 miles south of Winnsboro on Richland silt loam soil.

The tests received 500 pounds of 12-12-12 fertilizer in 1960 with 33½ pounds of nitrogen as a side dressing and 60 pounds of nitrogen, 60 pounds of phosphorus and 60 pounds of potash in 1961.

The Winnsboro area receives, as an average, 52.96 inches of rainfall annually, 23.43 inches of which falls during the 6-month period of April through September. According to the U. S. weather records, rainfall during this period was 5.64 inches below average in 1960 and 3.15 inches below average in 1961.

The tests were planted on May 13, 1960, and May 6, 1961. The varieties did not differ significantly in average yield of lint per acre during these two years of experiments. Pope, Stoneville Smooth Leaf, Dixie King, Auburn 56, Stoneville 7-A and Fox-4 produced above average for this 2-year period.

TABLE 16.—Rainfall data, Winnsboro, La., 1960-1961

| Year                | April | May  | June | July | Aug. | Sept. | April-Sept.<br>Departure<br>From Mean |
|---------------------|-------|------|------|------|------|-------|---------------------------------------|
| 1960                | 1.28  | 3.31 | 1.82 | 1.12 | 9.73 | 0.53  | —5.64                                 |
| 1961                | 1.85  | 2.68 | 5.90 | 4.96 | 2.47 | 2.42  | —3.15                                 |
| Monthly*<br>average | 4.30  | 4.89 | 3.91 | 5.04 | 2.87 | 2.42  |                                       |

\*U.S. Weather Bureau long-term mean.

**TABLE 17.—Two-year averages of cotton varieties tested on the Macon Ridge Branch  
Agricultural Experiment Station, Winnsboro, La., 1960-1961**

| Variety                                 | 2-year averages*        |      |                  |                  |                              |                                   |
|-----------------------------------------|-------------------------|------|------------------|------------------|------------------------------|-----------------------------------|
|                                         | Pounds of lint per acre |      | Lint<br>per acre | Lint<br>per cent | Staple<br>length<br>in 1/32" | Bolls per<br>pound seed<br>cotton |
|                                         | 1960                    | 1961 |                  |                  |                              |                                   |
| Pope                                    | 495                     | 1127 | 811              | 40.8             | 34.0                         | 82                                |
| Stoneville 7                            | 486                     | 1056 | 771              | 40.6             | 33.5                         | 84                                |
| Deltapine Smooth Leaf                   | 465                     | 1062 | 764              | 41.3             | 33.5                         | 81                                |
| Dixie King                              | 459                     | 1032 | 746              | 38.1             | 34.0                         | 65                                |
| Auburn 56                               | 442                     | 1034 | 738              | 37.9             | 34.5                         | 78                                |
| Stoneville 7-A                          | 434                     | 1033 | 734              | 40.6             | 33.5                         | 84                                |
| Fox-4                                   | 419                     | 1029 | 724              | 38.3             | 34.0                         | 82                                |
| Rex                                     | 465                     | 968  | 717              | 38.1             | 33.5                         | 74                                |
| Coker 100A-WR                           | 435                     | 998  | 717              | 39.0             | 34.0                         | 78                                |
| La. DC-1959                             | 438                     | 991  | 715              | 40.5             | 33.4                         | 81                                |
| Stoneville 3202                         | 443                     | 959  | 701              | 40.0             | 34.0                         | 84                                |
| Stardel                                 | 447                     | 946  | 697              | 40.6             | 34.5                         | 92                                |
| Plains                                  | 411                     | 968  | 690              | 38.1             | 33.5                         | 75                                |
| Empire                                  | 418                     | 939  | 679              | 37.6             | 34.0                         | 65                                |
| Delfos 9169                             | 412                     | 910  | 661              | 38.0             | 34.0                         | 72                                |
| Deltapine 15                            | 446                     | 847  | 647              | 40.6             | 33.4                         | 84                                |
| Stoneville 213                          | ...                     | 1172 | ...              | 40.2             | 34.0                         | 75                                |
| Delta Queen                             | ...                     | 1023 | ...              | 38.5             | 35.0                         | 68                                |
| La. 3314                                | ...                     | 907  | ...              | 39.2             | 34.0                         | 69                                |
| Mean lint per acre                      | 445                     | 953  | ...              | ...              | ...                          | ...                               |
| Difference required for<br>significance | N.S.**                  | 109  | ...              | ...              | ...                          | ...                               |

\*Computations for Stoneville 213, Delta Queen and La. 3314 are for 1961 only.

\*\*Not significant.

# IMPORTANCE OF FIBER STRENGTH IN LOUISIANA COTTON

Fiber strength and manufacturing performance is becoming more important to the producer each year. The following summary is presented to point out the fiber properties of Stardel and its relationship to average results from all varieties tested in the Southeastern, South Central, Southwestern and Western areas of the United States. The results were obtained from "Cotton Fiber and Processing Test Results for the Crop Year", Agriculture Information Bulletin Numbers 170, 186, 236 and 258.

Cotton fiber properties of Stardel compared with all varieties tested in the four principal cotton producing areas of the United States during 1956, 1957, 1960 and 1961

| Fiber properties           | 4-year averages of fiber processing results |         |            |               |            |
|----------------------------|---------------------------------------------|---------|------------|---------------|------------|
|                            | Stardel                                     | Western | South-west | South Central | South-east |
| Length (UHM)               | 1.07"                                       | 1.08"   | 0.98"      | 1.06"         | 1.03"      |
| Fineness (micronaire)      | 4.4                                         | 4.1     | 4.1        | 4.4           | 4.3        |
| Strength "0" gauge (psi)   | 90,000                                      | 89,000  | 79,000     | 81,000        | 78,000     |
| Grams per tex ("0" gauge)  | 44.4                                        | 43.6    | 38.9       | 39.7          | 38.4       |
| Grams per tex (1/8" gauge) | 23.6                                        | 24.5    | 20.9       | 21.4          | 20.2       |
| Average break factor       | 2350                                        | 2597    | 2203       | 2211          | 2127       |

These results, as well as other regional test results, indicate that Stardel, with its high yielding ability, high fiber strength and correct fineness, is well adapted to Louisiana and the entire Memphis trade territory of the Mississippi valley as well.



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Bulletin 560

*Adjustments for Higher Farm Incomes  
In the Hill Area of North Louisiana*

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## FOREWORD

This publication reports the results of a research study concerning adjustments for higher farm incomes in the hill area of North Louisiana.

Four D.A.E. circulars have previously appeared on this subject, each devoted to analysis of particular types of farms, namely, beef, dairy, cotton, and general farms. The circulars, however, were intended for limited distribution.

This bulletin consolidates and summarizes the results of the entire project. It is more than a descriptive report on the organization of existing farms. It evaluates existing practices and specifies the combination of resources required to attain annual returns of \$3,000 and \$5,000 for labor and investment in a farm business. It is specifically intended to answer penetrating questions concerning various farming enterprises. For example:

1. What size farm is needed to realize \$3,000 income? \$5,000 income?
2. How much capital is needed for investment? For operation?
3. What returns can be expected per acre? Per animal?
4. How much will investment and annual costs increase when attempting to increase income from \$3,000 to \$5,000?
5. How many acres of pasture and feed crops are needed? How many and what kind of livestock?

## ACKNOWLEDGMENTS

Gratitude is expressed to personnel of the North Louisiana Hill Farm Experiment Station, and particularly to the Superintendent, Mr. Dawson M. Johns, for help in planning and promoting this study. Appreciation is also extended to Drs. Fred H. Wiegmann and Willard Woolf for reviewing the manuscript, and to the county agents and sample of farmers who willingly provided the necessary farm data. Although not mentioned individually, many other people contributed to the preparation of this report and rightfully deserve a word of thanks.

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# Adjustments for Higher Farm Incomes In the Hill Area of North Louisiana

CLYDE J. ST. CLERGY AND FLOYD L. CORTY\*

## Introduction

Open land farming in Louisiana hill farm areas is rapidly giving way to forestry and other less intensive land uses. From 1954 to 1959 the total number of farms in the six-parish area, composed of Bienville, Claiborne, Jackson, Lincoln, Union, and Webster, decreased 42 percent, compared to 33 percent for the entire state. The decrease occurred in both commercial and noncommercial farms (Table 1). However, it is significant that the decrease in commercial farms occurred primarily among the groups realizing less than \$5,000 gross annual income. The number of commercial farms making over \$5,000 gross annual income increased 28 percent in the hill farm area in contrast to only 4 percent in Louisiana.

The rapid rate of forest development has been encouraged by financial assistance in the form of cost-sharing and rental payments through the Agricultural Conservation Program and the former Soil Bank Program as well as promotional campaigns sponsored by forestry enterprises. During the period 1955 to 1959, tree planting in the six-parish area, under both agricultural programs, totaled 87,813 acres, or an average of 17,963 acres per year. The extent of financial assistance and reforestation under the two programs is indicated in Table 2.

\*Assistant Professor, Hill Farm Experiment Station, Homer, Louisiana, and Associate Professor, Department of Agricultural Economics and Agribusiness, Louisiana State University, respectively.

**TABLE 1.—Number of Commercial Farms, and Noncommercial Farms in Six North Central Louisiana Parishes, and in Louisiana, 1954 and 1959**

|                  | Six North Central Louisiana<br>Parishes** |                  |                     | Louisiana        |                  |                     |
|------------------|-------------------------------------------|------------------|---------------------|------------------|------------------|---------------------|
|                  | 1954<br>(Number)                          | 1959<br>(Number) | Change<br>(Percent) | 1954<br>(Number) | 1959<br>(Number) | Change<br>(Percent) |
| Noncommercial*   | 6,423                                     | 4,618            | — 28                | 50,737           | 39,726           | — 21                |
| Commercial       | 3,028                                     | 1,410            | — 53                | 60,467           | 34,712           | — 42                |
| Over \$5,000     | 362                                       | 464              | + 28                | 11,989           | 12,497           | + 4                 |
| \$250 to \$4,999 | 2,666                                     | 946              | — 42                | 48,478           | 22,215           | — 54                |
| Total            | 10,403                                    | 6,028            | — 42                | 111,234          | 74,438           | — 33                |

\*Noncommercial — Farms on which the value of farm products sold was between \$50 and \$2,499, but the farm operator worked 100 or more days off the farm, or nonfarm income to operator or members of his family was greater than value of farm products sold.

\*\*Part of the reduction in total number of farms is a result of a loss of 1,607 farms in the six-parish area and a loss of 11,135 farms in Louisiana because of a change in farm definition in the 1959 Agricultural Census.

Source: United States Bureau of the Census, *Census of Agriculture—Preliminary Series AC 59-1* (Washington, D. C.: United States Government Printing Office, December 1960), p. 1.

**TABLE 2.—Number of Farms, Acreage, and Payments for Establishing Stands of Forest Trees Under the Agricultural Conservation Program and the Soil Bank Program, North Central Louisiana, 1955-1959**

| Program                                  | 1955   | 1956   | 1957   | 1958   | 1959    |
|------------------------------------------|--------|--------|--------|--------|---------|
| <b>Agricultural Conservation Program</b> |        |        |        |        |         |
| Number of farms                          | 417    | 488    | 617    | 621    | 804     |
| Acreage planted to trees                 | 7,338  | 7,418  | 8,979  | 7,996  | 10,476  |
| Dollar payments                          | 36,698 | 37,091 | 53,857 | 47,910 | 62,898  |
| <b>Soil Bank Program</b>                 |        |        |        |        |         |
| Number of farms                          | *      | 28     | 218    | 300    | 660     |
| Acreage planted to trees                 | *      | 1,220  | 8,509  | 9,165  | 26,712  |
| Dollar payments                          | *      | 8,691  | 62,182 | 63,807 | 173,092 |

Source: U. S. Department of Agriculture Commodity Stabilization Service, *Louisiana Report of Programs Administered by State and Parish A.S.C. Committees* (Alexandria: 1958-1959 and 1959-1960), pp. 45 and 53.

\*Soil Bank Program not in effect.

## Objectives of the Study

The gradual decline in open land farming is of major concern to farmers, businessmen, and professional agricultural workers. Many land-owners in the area want to know what is required for successful farming in an area that is rapidly losing many of its farms. Some have expressed the opinion that a reallocation of resources will prove that open land farming can still be profitable.

This study was undertaken to determine what combinations of resources and farm enterprises are still profitable in the hill farm area of North Central Louisiana. In order to achieve this objective, hypothetical farms were designed for the major farm enterprises now existing in the area. Input-output data were obtained from a sample of above-average farms and were used with recommendations from local experiment stations to synthesize the hypothetical farms.

## Method of Study

Data for this study were obtained by personal interview with 24 farmers in the hill farm area of North Central Louisiana. Selection of farms was limited to the four major farm types in the area, i.e., beef cattle, cotton, dairy, and general farms. Parish agricultural agents in the parishes of Bienville, Claiborne, Lincoln, Jackson, Union, and Webster supplied names of above-average (successful) farmers meeting the following conditions:

1. Farmers were resident owners.
2. At least 75 percent of gross income was obtained from the farm.
3. Fifty percent or more of gross income was obtained from the major farm enterprise. In the case of the general farm, no one enterprise could contribute more than 45 percent to gross income.

Six farms were selected for each of the four types of farming. Enumeration of the input-output data for each farm required two to three days. Data were collected the latter part of 1959; hence, input-output data reflect operations for calendar year 1958.

The better management practices of the six outstanding farmers in each enterprise were used to design a farm returning \$3,000 to the farmer for his labor and investment and also one returning \$5,000. Resources were combined in conformance with the practices of the above-average farmers in the sample. Where it was apparent, however, that the above-average farmers were not using the latest experiment station recommendations, adjustments were made to incorporate any superior practices recommended by experiment stations.

Budgeting was used to develop the model farms. Budgeting is an organized method of testing the relative profitability of alternative production practices or alternative organizations of the farm unit. A complete budget, or whole farm approach, was used in this study.

## **Accounting Procedure**

Costs were divided into two major categories; namely, (1) out-of-pocket costs plus depreciation, and (2) out-of-pocket costs plus depreciation plus interest on investment.

**Out-of-Pocket Costs Plus Depreciation** — Included in this classification are all out-of-pocket costs incurred during the year, such as feed, fertilizer, seed, hired labor, etc. In addition, depreciation on all farm equipment and buildings was included. Many farmers make managerial decisions based only on out-of-pocket costs. Over the long run, however, the farmer must be able to replace capital consumed in the production process. It is believed that farmers should follow practices of other businessmen and set aside funds each year to cover fixed capital assets consumed in the production process.

Absent from the above classification are charges for operator and family labor. Many farmers do not visualize this as a cost. They consider their labor as being readily available and without alternative employment value. Therefore, returns above all costs would be returns to labor. This is a reasonable assumption for most farmers in the area. Alternative employment opportunities are very scarce, and the chief alternative available to the majority of the farmers is abandonment or sale of the farm and migration to another area.

**Out-of-Pocket Costs Plus Depreciation Plus Interest on Investment**—Interest on investment is another cost that many farmers ignore. Most farmers feel that other investment opportunities would not return satisfactions equal to those derived from farm ownership. This concept applies particularly to farmers who own farms without mortgage encumbrance. On the other hand, a person who must borrow capital to enter farming should give this cost (interest on investment) the utmost consideration.

## **Limitations of the Study**

Averages used in designing farm plans are subject to the limitations normally associated with averages. Therefore, the farm plans presented in this publication should serve primarily as guides or bench marks.

**TABLE 3.—General Summary Table, Sample of Six Beef Cattle Farms, North Central Louisiana, 1958-59**

| Farms                 | Returns to<br>labor and<br>investment,<br>per farm<br>(Dollars) | Returns to<br>labor and<br>investment,<br>per acre<br>(Dollars) | Size<br>of<br>herd<br>(Number) | Acres<br>in<br>farm<br>(Acres) | Total<br>investment<br>(Dollars) |
|-----------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------|--------------------------------|----------------------------------|
| One                   | 2,543                                                           | 8.68                                                            | 63                             | 293                            | 38,585                           |
| Two                   | 2,092                                                           | 4.42                                                            | 106                            | 473                            | 90,174                           |
| Three                 | 1,793                                                           | 2.17                                                            | 167                            | 825                            | 99,910                           |
| Four                  | 1,731                                                           | 4.99                                                            | 93                             | 347                            | 76,336                           |
| Five                  | 1,461                                                           | 2.62                                                            | 60                             | 557                            | 67,105                           |
| Six                   | 9                                                               | .06                                                             | 33                             | 143                            | 29,465                           |
| Average—<br>all farms | 1,605                                                           | 3.82                                                            | 87                             | 440                            | 66,929                           |

## Beef Cattle Enterprise

### General Description of Sample Beef Cattle Farms

Table 3 presents a general summary of the six beef cattle farms included in this study. The farms are arrayed according to annual income. Net returns above out-of-pocket costs plus depreciation ranged from a low of \$9 to a high of \$2,543. On a per acre basis, net returns ranged from \$0.06 to \$8.68. The farms ranged in size from 143 acres to 825 acres and averaged 440 acres. Herd size ranged from 33 to 167. Total farm investment ranged from \$29,465 to \$99,910 and averaged \$66,929.<sup>1</sup>

One outstanding characteristic of the group of sample farms was that there was approximately one acre of bottom land soil for every five acres of hill soil.

### Economic Evaluation of the Six Sample Beef Farms

The basic weaknesses found in the pasture and feeding programs of the six sample farms are listed as follows:

1. Winter pasture with a late winter and early spring calving program was not economical. The cost of TDN (total digestible nutrients) obtained from winter pasture, on land that was also used to provide hay, was three cents per pound. (TDN requirements could be supplied at less cost through corn and grass hay.) (See Appendix Table 1.)
2. All sample farm operators could have reduced feed costs by feeding corn instead of cottonseed meal in the winter ration. The basic reason for feeding cottonseed meal, according to the farmers, was to add protein to the winter ration. However, protein in excess of recommended amounts was already being supplied by corn, and oat and grass hay. (See Appendix Table 2.)

<sup>1</sup>More detailed information concerning the beef cattle enterprise can be found in D.A.E. Circular 295, Department of Agricultural Economics and Agribusiness, Louisiana State University, Baton Rouge, Louisiana, November 1961.



3. Low returns per animal were primarily due to inefficient utilization of pastures. Either the herds were too small to utilize all the forage produced or pastures were overstocked. The most efficient farmer provided adequate forage from late-February to mid-November by supplementing approximately 1.5 acres of unimproved pasture per head with 0.6 acre of improved pasture and 1.3 acres of woodland pasture.

## **Hypothetical Model Beef Farms Yielding \$3,000 To Labor and Investment**

This section presents two synthetic farm models, each returning approximately \$3,000 to operator labor and investment. Farm A is a synthesis of desirable practices observed on the sample of beef cattle farms selected for study. Farm B incorporates pasture and feeding practices recommended by Louisiana Experiment Stations.

**Assumptions** — Input-output values are based on data obtained from the sample of six beef cattle farms.

The cow herd consisted of good-quality, Hereford brood cows valued at \$150 per cow, heifers at \$75, and bulls at \$500.

Open land was valued at \$126 per acre, and to each acre of open land, 0.23 acre, at \$60 per acre, was added for woodland and the homestead area. The aggregate value of the farm land included the value of the dwelling.

Investment in barns was limited to simple hay barns that provided storage for 230 tons of hay. Investment in farm implements and specialized livestock equipment was \$7,641.

Miscellaneous expenses and depreciation charges were allocated on a per head basis at the rate of \$7.87 and \$6.84, respectively, to correspond with costs observed on the sample farms (Appendix Table 3).

Returns to Model Beef Farms A and B are based on:

1. A 90 percent calf crop.
2. An 11 percent replacement rate, 3 percent of which was death loss.
3. A midwinter calf crop, beginning in January and continuing through late February and early March, with the calves to be marketed in the latter part of September. The calves of Model Beef Farm A are sold at \$22 per hundredweight and the cows at \$14 per hundredweight. The cows of Model Beef Farm B average 1,000 pounds and the calves 455 pounds due to the higher quality forage provided. Although cow prices are considered the same for both farms, the higher quality calves on Farm B are valued at \$25 per hundredweight.
4. The timbered acreage can provide approximately 130 board feet of sawlogs and 0.6 cord of pulpwood per acre annually. (This was the amount of saw timber and pulpwood produced on a representative farm woodlot selected and cruised by a forester from the North Louisiana Hill Farm Experiment Station.)

### Organization and Management of Beef Farm A (Extensive Model)—

Pasture requirements for Beef Farm A are 1.5 acres of unimproved pasture and 0.6 acre of improved pasture per head. Feeding consists primarily of corn and hay at the rate of 1,643 pounds of TDN per cow, obtained from 2,760 pounds of common Bermuda hay and 8.6 bushels of corn, cob, and shuck meal. This amount of hay and corn can be produced on about 0.8 acre and 0.2 acre, respectively. Since the hay is harvested in late May or early June, the hay meadow is also used the rest of the year for grazing.

Data regarding yields, cost of establishing and maintaining pastures, and labor requirements are given in Appendix Tables 4-11.

### Organization and Management of Beef Farm B (Intensive Model)—

Farm B differs from Farm A only in that the pasture and winter feeding program incorporates experiment station recommendations regarding use of fertilizer, pasture management, and winter feeding. The heavier applications of fertilizer and the intensive use of Coastal Bermuda hay in the feeding program contribute to the slightly higher cash costs and a reduction in acreage requirements.

Data pertaining to labor requirements and establishment and maintenance of pastures and hay meadows are given in Appendix Tables 12-16.

Capital required for beef cattle farms designed to return at least \$3,000 to operator labor and capital investment is given in Table 4. Note the somewhat higher investment associated with the more intensive system. Furthermore, in this system, capital has been shifted from land to livestock, thus increasing the risk.

Estimated costs and returns associated with the extensive and intensive beef farm models designed to give at least \$3,000 to operator labor and capital investment are given in Tables 5 and 6, respectively.

**TABLE 4.—Capital Required to Obtain a Return of at Least \$3,000 to Labor and Investment, Beef Farming, North Central Louisiana, (1958-59 Prices)**

|                          | Extensive |          | Intensive |          |
|--------------------------|-----------|----------|-----------|----------|
|                          | Number    | Value    | Number    | Value    |
| Livestock                |           |          |           |          |
| Brood cows @ \$150       | 75        | \$11,250 | 143       | \$21,450 |
| Heifers @ 75             | 8         | 600      | 16        | 1,200    |
| Bulls @ 500              | 3         | 1,500    | 5         | 2,500    |
| Total value of livestock |           | \$13,350 |           | \$25,150 |
| Barns                    |           | \$ 3,987 |           | \$ 3,987 |
| Land                     |           |          |           |          |
| Open acres @ \$126       | 267       | \$33,642 | 196       | \$24,696 |
| Timber acres @ \$60      | 61        | 3,660    | 36        | 2,160    |
| Total value of land      |           | \$37,302 |           | \$26,856 |
| Value of farm equipment  |           | \$ 7,641 |           | \$ 7,641 |
| Total capital investment |           | \$62,280 |           | \$63,634 |

**TABLE 5.—Estimated Costs and Returns of Beef Farm A (Extensive Plan), Returning About \$3,000 to Labor and Investment, North Central Louisiana, (1958-59 Prices)**

|                                                |                                  |         |
|------------------------------------------------|----------------------------------|---------|
| <b>Gross returns</b>                           |                                  |         |
| Calves                                         | 60 (428 lbs.) @ \$22 per cwt.    | \$5,650 |
| Cows (culls)                                   | 6 (800 lbs.) @ \$14 per cwt.     | 672     |
| Timber                                         | 61 acres @ \$6.75                | 412     |
| Total gross returns                            |                                  | \$6,734 |
| <b>Costs</b>                                   |                                  |         |
| Improved pasture                               | 52 acres @ \$ 7.50               | \$ 390  |
| Unimproved pasture                             | 129 acres @ \$ 1.55              | 200     |
| Hay meadow                                     | 69 acres @ \$15.99               | 1,103   |
| Corn                                           | 17 acres @ \$22.75               | 387     |
| Timber                                         | 61 acres @ \$ .34                | 21      |
| Miscellaneous                                  | \$7.03 per head (X 86 beef herd) | 604     |
| Depreciation                                   | \$6.84 per head (X 86 beef herd) | 588     |
| Marketing                                      | 4% of sales price of animal      | 253     |
| Taxes                                          | 328 acres @ \$ .15               | 49      |
| Total out-of-pocket plus depreciation costs    |                                  | \$3,595 |
| Returns to labor and investment                |                                  | \$3,139 |
| Returns per head                               |                                  | \$36.50 |
| Returns per acre                               |                                  | \$ 9.57 |
| Interest on investment (4 percent of \$62,280) |                                  | \$2,491 |
| Returns to labor                               | ( \$3,139 - \$2,491)             | \$ 648  |

**TABLE 6.—Estimated Costs and Returns of Farm B (Intensive Type), Returning About \$3,000 to Labor and Investment, North Central Louisiana, (1958-59 Prices)**

|                                                |                                   |          |
|------------------------------------------------|-----------------------------------|----------|
| <b>Gross returns</b>                           |                                   |          |
| Calves                                         | 113 ( 455 lbs.) @ \$25 per cwt.   | \$12,854 |
| Cows (cull)                                    | 11 (1,000 lbs.) @ \$14 per cwt.   | 1,540    |
| Timber                                         | 36 acres @ \$6.75                 | 243      |
| Total gross returns                            |                                   | \$14,637 |
| <b>Costs</b>                                   |                                   |          |
| Improved pasture                               | 164 acres @ \$35.21               | \$5,774  |
| Hay meadow                                     | 32 acres @ \$88.90                | 2,845    |
| Timber                                         | 36 acres @ \$ .34                 | 12       |
| Miscellaneous                                  | \$7.03 per head (X 164 beef herd) | 1,153    |
| Depreciation                                   | \$6.84 per head (X 164 beef herd) | 1,122    |
| Marketing                                      | 4% of sales price of animal       | 576      |
| Taxes                                          | 232 acres @ \$0.15                | 35       |
| Total out-of-pocket plus depreciation costs    |                                   | \$11,517 |
| Returns to labor and investment                |                                   | \$ 3,120 |
| Returns per head                               |                                   | \$ 19.02 |
| Returns per acre                               |                                   | \$ 13.45 |
| Interest on investment (4 percent of \$63,634) |                                   | \$ 2,545 |
| Returns to labor (\$3,120 - \$2,545)           |                                   | \$ 575   |

## Hypothetical Model Beef Farms Yielding \$5,000 To Labor and Investment

Two additional beef farms, Models C and D, were designed to return approximately \$5,000 to operator labor and investment. Farm C incorporates desirable practices observed on the six sample beef cattle farms, and Farm D introduces pasture and feeding practices recommended by local experiment stations.

Assumptions and estimated values of land and livestock are the same as for the previously mentioned Farms A and B. Investment in barns and farm equipment is slightly larger due to the larger farm sizes.

Even with a larger herd and larger land area, labor requirements are not a serious problem. Appendix Tables 17 and 18 present a monthly schedule of labor needed to operate Farms C and D.

The capital investments required for Farms C and D are given in Table 7. Note that for a given income on a large-scale farm the total capital investment is lower for an intensive operation, whereas on the smaller farm the intensive system requires more total capital investment than the extensive farming system. (See Table 4.)

Estimated costs and returns associated with extensive and intensive beef farms designed to return at least \$5,000 to operator labor and capital investment are given in Tables 8 and 9, respectively.

Table 10 presents a summary of the four hypothetical farms designed in this study. A comparison of extensive models and intensive models indicates that although the total acreage of land needed to obtain the desired levels of income can be decreased considerably by utilizing intensive methods, the total annual working capital outlay must be increased substantially. In order to obtain a return to labor and investment of \$3,000, the intensive model requires 96 acres less land but an increase in annual working capital of \$7,392. At the \$5,000

**TABLE 7.—Capital Required to Obtain a Return of at Least \$5,000 to Labor and Investment on a Beef Farm, North Central Louisiana, (1958-59 Prices)**

|                          | Extensive |          | Intensive |          |
|--------------------------|-----------|----------|-----------|----------|
|                          | Number    | Value    | Number    | Value    |
| <b>Livestock</b>         |           |          |           |          |
| Brood cows @ \$150       | 127       | \$19,050 | 219       | \$32,850 |
| Heifers @ 75             | 14        | 1,050    | 24        | 1,800    |
| Bulls @ 500              | 4         | 2,000    | 7         | 3,500    |
| Total value of livestock |           | \$22,100 |           | \$38,150 |
| Barns                    |           | \$ 4,041 |           | \$ 4,041 |
| <b>Land</b>              |           |          |           |          |
| Open acres @ \$126       | 450       | \$56,700 | 299       | \$37,674 |
| Timbered acres @ \$ 60   | 103       | 6,180    | 68        | 4,080    |
| Total value of land      |           | \$62,880 |           | \$41,754 |
| Value of farm equipment  |           | \$ 7,641 |           | \$ 7,641 |
| Total capital investment |           | \$96,662 |           | \$91,586 |



income level, the intensive model requires 186 acres less land but an increase in working capital of \$10,815. This may explain why many beef cattle farmers have not turned to intensive pasture and feeding programs. An annual cash outlay of 7 to 10 thousand dollars could

**TABLE 8.—Estimated Costs and Returns of Beef Farm C, Returning About \$5,000 to Labor and Investment, North Central Louisiana (Extensive Plan), (1958-59 Prices)**

|                                                |                                   |          |
|------------------------------------------------|-----------------------------------|----------|
| <b>Gross returns</b>                           |                                   |          |
| Calves                                         | 100 (428 lbs.) @ \$22 per cwt.    | \$ 9,416 |
| Cows (culls)                                   | 10 (800 lbs.) @ \$14 per cwt.     | 1,120    |
| Timber                                         | 103 acres @ \$6.75                | 695      |
| Total gross returns                            |                                   | \$11,231 |
| <b>Costs</b>                                   |                                   |          |
| Improved pasture                               | 87 acres @ \$ 7.50                | \$ 652   |
| Unimproved pasture                             | 218 acres @ \$ 1.55               | 338      |
| Hay meadow                                     | 116 acres @ \$15.99               | 1,854    |
| Corn                                           | 29 acres @ \$22.95                | 666      |
| Timber                                         | 103 acres @ \$ 0.34               | 35       |
| Miscellaneous                                  | \$7.03 per head (X 145 beef herd) | 1,019    |
| Depreciation                                   | \$6.84 per head (X 145 beef herd) | 992      |
| Marketing                                      | 4% of sales price of animal       | 421      |
| Taxes                                          | 553 acres @ \$ 0.15               | 83       |
| Total out-of-pocket costs plus depreciation    |                                   | \$ 6,060 |
| Returns to labor and investment                |                                   | \$ 5,171 |
| Returns per cow                                |                                   | \$ 35.71 |
| Returns per acre                               |                                   | \$ 9.36  |
| Interest on investment (4 percent of \$96,662) |                                   | \$ 3,866 |
| Returns to labor                               | (\$5,171 - \$3,866)               | \$ 1,305 |

**TABLE 9.—Estimated Costs and Returns of Beef Farm D, Returning About \$5,000 to Labor and Investment, North Central Louisiana (Intensive Plan), (1958-59 Prices)**

|                                                |                                  |          |
|------------------------------------------------|----------------------------------|----------|
| <b>Gross returns</b>                           |                                  |          |
| Calves                                         | 173 (455 lbs.) @ \$25 per cwt.   | \$19,679 |
| Cows (cull)                                    | 18 (1,000 lbs.) @ \$14 per cwt.  | 2,520    |
| Timber                                         | 68 acres @ \$6.75                | 459      |
| Total gross returns                            |                                  | \$22,658 |
| <b>Costs</b>                                   |                                  |          |
| Improved pasture                               | 250 acres @ \$35.21              | \$ 8,802 |
| Hay meadow                                     | 49 acres @ \$88.90               | 4,356    |
| Timber                                         | 68 acres @ \$ .34                | 23       |
| Miscellaneous                                  | \$7.03 per cow (X 250 beef herd) | 1,758    |
| Depreciation                                   | \$6.84 per cow (X 250 beef herd) | 1,710    |
| Marketing                                      | 4% of sales price of animal      | 889      |
| Taxes                                          | 367 acres @ \$ 0.15              | 55       |
| Total out-of-pocket plus depreciation costs    |                                  | \$17,593 |
| Returns to labor and investment                |                                  | \$ 5,065 |
| Returns per cow                                |                                  | \$ 20.26 |
| Returns per acre                               |                                  | \$ 13.80 |
| Interest on investment (4 percent of \$91,586) |                                  | \$ 3,663 |
| Returns to labor                               | (\$5,065 - \$3,663)              | \$ 1,402 |

**TABLE 10.—Beef Cattle Farm Plans Designed to Provide \$3,000 and \$5,000 Returns to Labor Investment, North Central Louisiana, (1958-59 Prices)**

| Item                                     | \$3,000 Level |             | \$5,000 Level |             |
|------------------------------------------|---------------|-------------|---------------|-------------|
|                                          | Extensive     | Intensive   | Extensive     | Intensive   |
|                                          | Plan<br>(A)   | Plan<br>(B) | Plan<br>(C)   | Plan<br>(D) |
| Size                                     |               |             |               |             |
| Acres                                    | 328           | 232         | 553           | 367         |
| Herd (No. of head)                       | 86            | 164         | 145           | 250         |
| Pasture                                  |               |             |               |             |
| Improved (acres)                         | 52            | 164         | 87            | 250         |
| Unimproved (acres)                       | 129           | ...         | 218           | ...         |
| Feed crops                               |               |             |               |             |
| Corn (acres)                             | 17            | ...         | 29            | ...         |
| Hay (acres)                              | 69            | 32          | 116           | 68          |
| Out-of-pocket costs                      | \$ 3,007      | \$10,395    | \$ 5,068      | \$15,883    |
| Out-of-pocket costs<br>plus depreciation | \$ 3,595      | \$11,517    | \$ 6,060      | \$17,593    |
| Gross returns                            | \$ 6,734      | \$14,637    | \$11,231      | \$22,658    |
| Returns per head                         | \$ 36.50      | \$ 19.02    | \$ 35.66      | \$ 20.26    |
| Returns per acre                         | \$ 9.57       | \$ 13.45    | \$ 9.36       | \$ 13.80    |
| Investment                               | \$62,280      | \$63,634    | \$96,662      | \$91,586    |

mean a sizeable cash loss during an unfavorable year. The extensive models which typify the current practices of farmers in the hill farm area reflect their more conservative thinking. More land is used, but annual cash outlay is small. Thus, the risk of loss is considerably reduced.

## The Dairy Enterprise

### General Description of the Sample Dairy Farms

Of the six sample dairy farms selected for study, two were located in Bienville Parish and one each in the parishes of Claiborne, Jackson, Lincoln, and Union. A general summary of returns, farm size, number of milking cows, and total investment of the six sample dairy farms is presented in Table 11.

**TABLE 11.—General Summary Table, Six Dairy Farms, North Central Louisiana, (1958-59)**

| Farms          | Net returns to<br>labor and investment |           | Average<br>number of<br>cows in<br>lactation | Farm<br>size | Total<br>investment |
|----------------|----------------------------------------|-----------|----------------------------------------------|--------------|---------------------|
|                | Per farm                               | Per acre  |                                              |              |                     |
|                | (Dollars)                              | (Dollars) | (Number)                                     | (Acres)      | (Dollars)           |
| One            | 7,484                                  | 12.05     | 81                                           | 621          | 144,412             |
| Two            | 4,603                                  | 26.76     | 38                                           | 172          | 47,261              |
| Three          | 2,429                                  | 18.40     | 30                                           | 132          | 37,401              |
| Four           | 2,185                                  | 9.62      | 37                                           | 227          | 51,746              |
| Five           | 1,953                                  | 12.85     | 36                                           | 152          | 40,049              |
| Six            | — 274                                  | —1.03     | 28                                           | 265          | 29,583              |
| Sample average | 3,063                                  | 11.71     | 42                                           | 262          | 58,409              |

Five of the six farms were mortgaged and three of the farms had obtained short-term loans. The mortgages ranged in size from \$700 to \$52,000 and the short-term loans from \$1,200 to \$29,000.

## Economic Evaluation of the Six Sample Dairy Farms

The high net return to labor and investment per acre on the most successful farm was basically due to a better-than-average milking herd in combination with a more efficient pasture and concentrate feeding program. The farm operator provided 1.1 acres of improved permanent pasture and 0.3 acre of temporary summer pasture, per head, for the milking herd. About 1.7 acres of unimproved pasture per head were supplied to dry cows and heifers during the summer months. All animals were placed on oat forage at the rate of 1.1 acres per head during the winter months. The entire herd was fed hay on a free-choice basis throughout the winter months, and some hay was fed to dry cows and heifers during the hot part of the summer when the unimproved permanent pasture did not provide sufficient forage.

Temporary summer pasture at the rate of 0.3 acre per head, on the most efficient farm, was not sufficient to adequately supplement the improved permanent pasture during the months of July and August. Another farm operator, however, reported excess forage on 0.9 acre of temporary summer pasture per cow. Thus, it would appear that approximately 0.5 acre of temporary summer pasture per cow in combination with 1.1 acres of improved pasture would supply adequate forage.

Two major weaknesses were evident in the feeding program of the most efficient farm. First, the operator could have fed the dry cows and heifers a less expensive winter ration. Second, although the concentrate-milk ratio was higher than for other farmers, it was still below the recommended ratio of one pound of concentrate to three pounds of milk, for cows grazed on average pasture (Table 12).

The negative returns per acre on Farm No. 6 resulted from exceptionally high pasture and purchased feed costs. These costs were higher than normal because: first, the operator believed that most feeds could be purchased at less cost than they could be raised on the farm,

**TABLE 12.—Relationship Between Milk Production per Cow, Milk-Concentrate Ratio, and Income, Six Dairy Farms, North Central Louisiana, 1958-59**

| Farms | Net<br>returns<br>per cow | Pounds<br>of milk<br>per cow | Pounds of milk<br>per pound of<br>concentrate |
|-------|---------------------------|------------------------------|-----------------------------------------------|
|       | (Dollars)                 | (Pounds)                     | (Pounds)                                      |
| Two   | 67.69                     | 5,821                        | 2.4                                           |
| One   | 57.57                     | 8,583                        | 1.7                                           |
| Three | 43.38                     | 2,751                        | 1.7                                           |
| Four  | 36.42                     | 3,700                        | 1.2                                           |
| Five  | 35.51                     | 3,001                        | 1.1                                           |
| Six   | -5.95                     | 5,613                        | 2.2                                           |

and second, the operator believed that it was less costly to hire all tillage operations rather than purchase the necessary equipment and perform the operations himself. The negative returns tend to disprove these beliefs.

Land resources were not used to capacity on any of the sample farms. Producing summer supplementary pasture on the same acreage used for temporary winter pasture would support larger herds or, on the other hand, require less land. The practice of planting only one feed crop on land used for temporary pasture left land resources unused for half of the year.<sup>2</sup>

## Hypothetical Model Dairy Farms Yielding \$3,000 To Labor and Investment

Two model dairy farms were designed to return \$3,000 to operator labor and investment, in much the same manner as that used in designing the model beef cattle farms. Farm A is a synthesis of desirable practices observed on the six sample dairy farms, and Farm B incorporates pasture and feeding practices recommended by Louisiana experiment stations.

Table 13 presents the assumed values and practices used to compute

<sup>2</sup>More detailed information concerning the dairy enterprise can be found in D.A.E. Circular 296, Department of Agricultural Economics, Louisiana State University, Baton Rouge, Louisiana, November 1961.

**TABLE 13.—Assumed Values and Practices for Dairy Farms A and B, North Central Louisiana, 1958-59\***

| Item                                 | Dairy Farm A<br>(Extensive) | Dairy Farm B<br>(Intensive) |
|--------------------------------------|-----------------------------|-----------------------------|
| Assumed values                       |                             |                             |
| Cows@                                | \$ 200                      | \$ 250**                    |
| Heifer (over one year)@              | 150                         | 188**                       |
| Heifer (under one year)@             | 60                          | 75                          |
| Bull@                                | 200                         |                             |
| Open land (per acre)                 | 119                         | 119                         |
| Woodland, wasteland, etc. (per acre) | 60                          | 60                          |
| Barns                                | 3,738                       | 3,738                       |
| Milk parlor                          | 1,083                       | 1,083                       |
| Farm equipment                       | 5,603                       | 6,513                       |
| Dairy equipment                      | 2,466                       | 2,466                       |
| Silo                                 | —                           | 1,223**                     |
| Blend price (per hundredweight)      | 5.70                        | 5.70                        |
| Miscellaneous expenses (per head)*** | 13.49                       | 11.44                       |
| Depreciation (per head)              | 15.44                       | 17.37                       |
| Assumed practices                    |                             |                             |
| Lactation period (months)            | 10                          | 10                          |
| Replacement rate (percent)           | 23                          | 23                          |
| Calf crop (percent)                  | 77                          | 77                          |
| Milk production (lbs. 4% butterfat)  | 5,821                       | 7,500**                     |

\*Based on data obtained from sample farms.

\*\*Adapted from Woolf, C. M., *Resource Requirements and Returns For a Family-Size Dairy Farm* (Unpublished Thesis; Baton Rouge: Louisiana State University, January 1960), p. 97.

\*\*\*See Appendix Table 19 for list of expenses included in the miscellaneous category.



total investment for both model farms. Wherever practical, investment and practices for different components of the dairy operation were based on data obtained from the sample dairy farms.

#### Organization and Management of Dairy Farm A (Extensive Model)

— On a per head basis, it was assumed that 1.1 acres of improved pasture seeded to lespedeza, crimson clover, and common Bermuda grass, in combination with 0.5 acre of millet, would produce sufficient early spring, summer, and fall grazing. In addition, 1.1 acres of winter pasture per head were provided. Part of the winter pasture, however, was harvested for hay. In addition, part of the acreage was plowed under in April and planted to millet for the temporary summer pasture.

It was also assumed that 1.7 acres of unimproved pasture were available to each dry cow and heifer during the summer. Hay is needed to supplement the unimproved pasture during the latter half of June and all of July. Hay is also needed to carry the dry cows and heifers through the winter at the rate of 2,760 pounds for each dry cow and heifer over one year of age and 760 pounds for each heifer under one year.

Fertilizer applications and hay yields are based on data obtained from the sample of beef cattle farms. Since only three of the dairy farms had hay meadows and the variations in yield, fertilizer application, and type of forage were so great, it was necessary to evaluate the data very carefully. Thus, it was assumed that approximately 0.6

**TABLE 14.—Capital Investment Required to Obtain \$3,000 Return to Labor and Investment on Dairy Farms A and B, North Central Louisiana**

|                          |               | Farm A |          | Farm B |          |
|--------------------------|---------------|--------|----------|--------|----------|
|                          |               | Number | Value    | Number | Value    |
| <b>Livestock</b>         |               |        |          |        |          |
| Dairy cows               | @ \$200-\$250 | 20     | \$ 4,000 | 16     | \$ 4,000 |
| Heifers (over one year)  | @ 150- 188    | 5      | 750      | 4      | 752      |
| Heifers (under one year) | @ 60- 75      | 7      | 420      | 6      | 450      |
| Bull                     | @ 200         | 1      | 200      | ..     | ...      |
| Total livestock          |               |        | \$ 5,370 |        | \$ 5,202 |
| <b>Buildings</b>         |               |        |          |        |          |
| Barns                    |               |        | \$ 3,738 |        | \$ 3,738 |
| Milk parlor              |               |        | 1,083    |        | 1,083    |
| Silo                     |               |        |          |        | 1,223    |
| Total buildings          |               |        | \$ 4,821 |        | \$ 6,044 |
| <b>Land</b>              |               |        |          |        |          |
| Open land (acres)        | @ \$119       | 68     | \$ 8,092 | 40     | \$ 4,760 |
| Woodland (acres)         | @ 60          | 10     | 600      | 6      | 360      |
| Total land               |               |        | \$ 8,692 |        | \$ 5,120 |
| Farm equipment           |               |        | \$ 5,603 |        | \$ 6,513 |
| Dairy equipment          |               |        | \$ 2,466 |        | \$ 2,466 |
| Total capital investment |               |        | \$26,952 |        | \$25,345 |

acre per head would be used for hay meadow. After the hay harvest, this acreage is used to supplement the unimproved pasture to carry the dry cows and heifers through the summer.

Appendix Tables 20-26 present the annual cost of establishing and maintaining the different types of pastures. Based on the assumed pasture program, one pound of concentrate is fed for each three pounds of milk produced.

Dry cows and heifers over one year are carried entirely on pasture forage during the summer. The winter feeding program consists chiefly of corn and hay in amounts specified in the Model A Beef Farm. (See Page 10.)

**Organization and Management of Dairy Farm B (Intensive Model)**—Inputs used in designing Dairy Farm B were obtained from various experiment station reports that were applicable to the North Central Louisiana area. Pasture acreage per head on Farm B is assumed to consist of 1.1 acres of Coastal Bermuda permanent pasture, 0.5 acre of temporary summer pasture, and 1.25 acres of temporary winter pasture.

Harvested forage crops are fed at the rate of three tons of silage and

**TABLE 15.—Estimated Costs and Returns of Dairy Farm A, North Central Louisiana**

|                                         |                                |         |
|-----------------------------------------|--------------------------------|---------|
| <b>Gross returns</b>                    |                                |         |
| Milk                                    | 1138.6 cwt. of milk @ \$5.70   | \$6,490 |
| Cull cows                               | 4 cows @ \$137                 | 548     |
| Calves                                  | 22 calves @ \$8                | 64      |
| Timber                                  | 10 acres @ \$6.75              | 67      |
| Total gross returns                     |                                | \$7,169 |
| <b>Costs</b>                            |                                |         |
| Improved pasture                        | 19 acres @ \$ 9.60             | \$ 182  |
| Unimproved pasture                      | 15 acres @ \$ 1.55             | 23      |
| Temporary summer pasture                | 10 acres @ \$17.39             | 174     |
| Temporary winter pasture                | 19 acres @ \$14.39             | 463     |
| Harvesting hay from winter pasture      | 9 acres @ \$ 7.58              | 68      |
| Hay meadow                              | 22 acres @ \$15.99             | 352     |
| Woodland                                | 10 acres @ \$ .33              | 3       |
| Dairy concentrate (16%)                 | 388.1 cwt. @ \$3.05            | 1,184   |
| Corn, cob, and shuck meal               | 54.2 cwt. @ \$2.00             | 108     |
| Calf feed                               | 2.6 cwt. of starter @ \$10.25  | 27      |
|                                         | 6.6 cwt. of grower @ \$ 3.95   | 26      |
|                                         | 25.6 cwt. of milk @ \$5.70     | 146     |
| Hired labor                             | 30.2 ten-hour days @ \$5.00    | 151     |
| Milk hauling                            | 1138.6 cwt. @ .36              | 410     |
| Miscellaneous                           | \$11.37 per animal unit (x 29) | 330     |
| Depreciation                            | \$15.44 per animal unit (x 29) | 448     |
| Taxes                                   | 78 acres @ \$0.38              | 30      |
| Total costs                             |                                | \$4,125 |
| Net returns to labor and investment     |                                | \$3,044 |
| Returns per cow                         |                                | 104.96  |
| Returns per acre                        |                                | 39.02   |
| Interest on investment (4% of \$26,952) |                                | 1,078   |
| Returns to labor                        |                                | 1,966   |

**TABLE 16.—Estimated Costs and Returns of Dairy Farm B, North Central Louisiana,  
(1958-59 Prices)**

|                                            |                               |           |
|--------------------------------------------|-------------------------------|-----------|
| <b>Gross returns</b>                       |                               |           |
| Milk                                       | 1178 cwt. of milk @ \$5.70    | \$6,715   |
| Cull cows                                  | 3 calves @ \$137              | 411       |
| Calves                                     | 7 calves @ \$8                | 56        |
| Timber                                     | 6 acres @ \$6.75              | 40        |
| Total gross returns                        |                               | \$7,222   |
| <b>Costs</b>                               |                               |           |
| Improved pasture                           | 22 acres @ \$35.21            | \$ 775    |
| Temporary summer pasture                   | 8 acres @ \$24.66             | 197       |
| Temporary winter pasture                   | 16 acres @ \$30.76            | 492       |
| Millet silage                              | 2 acres @ \$48.62             | 97        |
| Silage harvested from winter pasture       | 3 acres @ \$17.71             | 53        |
| Surplus hay from pasture                   | 5.9 tons @ \$4.89             | 29        |
| Coastal Bermuda hay meadow                 | 2 acres @ \$88.90             | 178       |
| Woodland                                   | 6 acres @ \$ .33              | 2         |
| Dairy concentrates (16%)                   | 300 cwt. @ \$3.05             | 915       |
| Calf feed                                  | 2.2 cwt. of starter @ \$10.25 | 23        |
|                                            | 5.7 cwt. of grower @ \$3.95   | 22        |
|                                            | 22.0 cwt. of milk @ \$5.70    | 125       |
| Hired labor                                | 30.2 ten-hour days @ \$5.00   | 151       |
| Miscellaneous                              | \$9.32 per head (x 22)        | 205       |
| Breeding fees                              | \$5.00 per cow (x 16)         | 80        |
| Milk hauling                               | 1178 cwt. @ \$ .36            | 424       |
| Depreciation                               | \$17.37 per head (x 22)       | 382       |
| Taxes                                      | 46 acres @ .38                | 17        |
| Total costs                                |                               | \$4,167   |
| <b>Net returns to labor and investment</b> |                               |           |
| Returns per cow                            |                               | \$ 138.86 |
| Returns per acre                           |                               | \$ 66.41  |
| Interest on investment (4% of \$25,345)    |                               | \$1,014   |
| Net returns to labor                       |                               | \$2,041   |

one ton of Coastal Bermuda grass hay per head. Silage is obtained from part of the temporary winter pasture and the acreage planted to millet. Hay is harvested from the permanent pasture and a Coastal Bermuda hay meadow. In consideration of the improved pasture and silage program, concentrates are fed at the rate of one pound for each four pounds of milk produced. Annual costs for establishing and maintaining pastures and for providing hay and silage are given in Appendix Tables 20-26.

**Labor Inputs** — The operator is required to work 25 to 29 eight-hour days nine months of the year. Additional labor is hired for hay harvesting in May and June and for pasture seeding in September. Labor requirements on Farm B are less stringent than for Farm A because of substituting silage for some hay and pasture (Appendix Tables 27 and 28). Additional help is hired to milk and perform other day to day operations. Hired help of this type on the sample farms averaged 59 days out of the year.

**Costs and Returns** — Table 14 presents the capital investment required for Model Farms A and B, while Tables 15 and 16 present summaries of the costs and returns. When interest on investment is deducted, net returns to the operator for his labor decrease to \$1,966 on Farm A and to \$2,041 on Farm B. If a charge of 50c per hour is made for operator's labor, net returns above all costs decrease to \$967 for Farm A and to \$1,436 for Farm B.

## Hypothetical Model Dairy Farms Yielding \$5,000 To Labor and Investment

As was done with the beef farms, two hypothetical model dairy farms were designed to return approximately \$5,000 above out-of-pocket costs plus depreciation. Dairy Farm Plan C results from a synthesis of desirable practices observed on the six sample farms, and Farm Plan D incorporates pasture and feeding practices recommended by Louisiana Experiment Stations.

**Organization and Management of Dairy Farm C (Extensive Model)** — Assumptions and estimated value of land and livestock are the same as for Farms A and B. Investment in buildings and equipment remains the same. Essentially, the same equipment is needed for a 15-cow dairy herd as for a 35-cow dairy herd.

The pasture and feeding program for Dairy Farm C is assumed to be the same as for Dairy Farm A. Labor requirements are greater than for Farm A because of the larger milking herd and larger land

**TABLE 17.—Capital Investment Required for Dairy Farms C and D, North Central Louisiana**

|                           |                 | Extensive (C) |          | Intensive (D) |          |
|---------------------------|-----------------|---------------|----------|---------------|----------|
|                           |                 | Number        | Value    | Number        | Value    |
| <b>Livestock</b>          |                 |               |          |               |          |
| Dairy cows                | @ \$200 & \$250 | 32            | \$ 6,400 | 27            | \$ 6,750 |
| Heifers (over one year)   | @ 150 & 188     | 7             | 1,050    | 6             | 1,128    |
| Heifers (under one year)) | @ 60 & 75       | 9             | 540      | 8             | 600      |
| Bulls                     | @ 200           | 1             | 200      | ..            | ...      |
| Total livestock           |                 |               | \$ 8,190 |               | \$ 8,478 |
| <b>Buildings</b>          |                 |               |          |               |          |
| Barns                     |                 |               | \$ 3,738 |               | \$ 3,738 |
| Milk parlor               |                 |               | 1,083    |               | 1,083    |
| Total buildings           |                 |               | \$ 4,821 |               | \$ 4,821 |
| <b>Land</b>               |                 |               |          |               |          |
| Open land (acres)         | @ \$119         | 104           | \$12,376 | 65            | \$ 7,735 |
| Woodland (acres)          | @ \$ 60         | 15            | 900      | 9             | 540      |
| Total land                |                 |               | \$13,276 |               | \$ 8,275 |
| Farm equipment            |                 |               | \$ 5,603 |               | \$ 6,513 |
| Dairy equipment           |                 |               | \$ 2,466 |               | \$ 2,466 |
| Total capital investment  |                 |               | \$34,356 |               | \$31,776 |



**TABLE 18.—Estimated Costs and Returns of Dairy Farm C, North Central Louisiana, (1958-59 Prices)**

|                                         |                                |  |          |
|-----------------------------------------|--------------------------------|--|----------|
| <b>Gross returns</b>                    |                                |  |          |
| Milk                                    | 1829.8 cwt. of milk @ \$5.70   |  | \$10,430 |
| Cull cows                               | 6 cows @ \$137                 |  | 822      |
| Calves                                  | 15 calves @ \$8                |  | 120      |
| Timber                                  | 15 acres @ \$6.75              |  | 100      |
| Total gross returns                     |                                |  | \$11,473 |
| <b>Costs</b>                            |                                |  |          |
| Improved pasture                        | 30 acres @ \$ 9.60             |  | \$ 288   |
| Unimproved pasture                      | 22 acres @ \$ 1.55             |  | 34       |
| Temporary summer pasture                | 15 acres @ \$17.39             |  | 261      |
| Temporary winter pasture                | 30 acres @ \$24.39             |  | 732      |
| Harvesting hay from winter pasture      | 15 acres @ \$ 7.58             |  | 114      |
| Hay meadow                              | 22 acres @ \$15.99             |  | 352      |
| Timberland                              | 15 acres @ \$ .33              |  | 5        |
| Dairy concentrate (16%)                 | 620.9 cwt. @ \$3.05            |  | 1,894    |
| Corn, cob, and shuck meal               | 78.3 cwt. @ \$2.00             |  | 157      |
| Calf feed                               | 3.3 cwt. of starter @ \$10.25  |  | 34       |
|                                         | 8.6 cwt. of grower @ \$3.95    |  | 34       |
|                                         | 32.9 cwt. of milk @ \$5.70     |  | 193      |
| Hired labor                             | 58.8 ten-hour days @ \$5.00    |  | 294      |
| Miscellaneous                           | \$13.49 per animal unit (x 43) |  | 580      |
| Milk hauling                            | 1829.8 cwt. of milk @ \$0.36   |  | 659      |
| Depreciation                            | 15.44 per animal unit (x 43)   |  | 664      |
| Taxes                                   | 119 acres @ .38                |  | 45       |
| Total cost                              |                                |  | \$ 6,340 |
| Net returns to labor and investment     |                                |  | \$ 5,133 |
| Returns per cow                         |                                |  | \$ 119   |
| Returns per acre                        |                                |  | \$ 43.43 |
| Interest on investment (4% of \$34,356) |                                |  | \$ 1,374 |
| Net returns to labor                    |                                |  | \$ 3,759 |

area. Labor requirements, however, can still be supplied by the farm operator and his family, except for the months of May, June, and September. (See Appendix Table 29.)

**Organization and Management of Dairy Farm D (Intensive Model)**—The pasture and feeding program of Dairy Farm D is assumed to be the same as for Dairy Farm B.

Labor requirements for Dairy Farm D are not as stringent as for Farm C. Total hours of labor are higher, but the work loads are more evenly distributed through the year. (See Appendix Table 30.)

**Costs and Returns** — Table 17 gives the fixed capital investment required for Dairy Farms C and D, and Tables 18 and 19 present estimated costs and returns for the two farms. Note that when interest on investment, computed at 4 per cent, is included as a cost, returns to labor decrease to about \$3,800. Furthermore, if a charge is made for the operator's labor, at 50 cents an hour, net profits amount to about \$2,600.

Table 20 presents a summary of the important features of the four model dairy farms. A comparison of the models at the two income

levels reveals only slight differences in costs and returns. At the \$3,000 income level, the extensive model requires 32 more acres than the intensive model, and at the \$5,000 income level 45 more acres are needed in the extensive model. Net returns per acre and per cow are greater on the intensive model dairy farms and total investment is less.

One basic weakness stands out in the current farm operations. The level of production of the highest producing cows on the sample farms is low in comparison to the production average for cows in the major milk producing states. Apparently the favorable returns with relatively low investment can be attributed to institutional protection of milk prices.

The major conclusion to be drawn from the dairy farm data is that the dairy enterprise is relatively profitable in the North Central Louisiana area at prevailing milk prices. The farm models indicate that an adequate return on investment can be obtained even when a charge is made for the operator's labor. It must be recognized, however, that the dairy enterprise, unlike the beef enterprise, is subject to

**TABLE 19.—Estimated Costs and Returns of Dairy Farm D, North Central Louisiana, (1958-59 Prices)**

|                                        |                                |          |
|----------------------------------------|--------------------------------|----------|
| <b>Gross returns</b>                   |                                |          |
| Milk                                   | 1995.7 cwt. of milk @ \$5.70   | \$11,375 |
| Cull cows                              | 4 cows @ \$137                 | 548      |
| Calves                                 | 12 calves @ \$8                | 96       |
| Timber                                 | 9 acres @ \$6.75               | 61       |
| Total gross returns                    |                                | \$12,080 |
| <b>Costs</b>                           |                                |          |
| Improved pasture                       | 36 acres @ \$35.21             | \$ 1,268 |
| Temporary summer pasture               | 12 acres @ \$24.66             | 296      |
| Temporary winter pasture               | 25 acres @ \$30.76             | 769      |
| Millet silage                          | 4 acres @ \$48.62              | 194      |
| Silage from winter pasture             | 5 acres @ \$17.71              | 88       |
| Surplus hay from pasture               | 9.6 tons @ \$4.89              | 47       |
| Coastal Bermuda hay meadow             | 4 acres @ \$88.90              | 356      |
| Timber                                 | 9 acres @ \$ .33               | 3        |
| Dairy concentrates (16%)               | 506.2 cwt. @ \$3.05            | 1,544    |
| Calf feed                              | 3.0 cwt. of starter @ \$10.25  | 31       |
|                                        | 7.6 cwt. of grower @ \$3.95    | 30       |
|                                        | 29.3 cwt. of milk @ \$5.70     | 167      |
| Hired labor                            | 58.8 ten-hour days @ \$5.00    | 294      |
| Miscellaneous                          | \$11.44 per animal unit (x 36) | 412      |
| Breeding fees                          | \$5. per cow                   | 135      |
| Milk hauling                           | 1995.7 cwt. @ \$.36            | 718      |
| Depreciation                           | \$17.37 per animal unit (x 36) | 625      |
| Taxes                                  | 74 acres @ \$.38               | 28       |
| Total cost                             |                                | \$ 7,005 |
| Net returns to labor and investment    |                                | \$ 5,075 |
| Returns per cow                        |                                | \$ 141   |
| Returns per acre                       |                                | \$ 69    |
| Interest on investment (4% x \$31,776) |                                | \$ 1,271 |
| Returns to labor                       |                                | \$ 3,804 |

**TABLE 20.—Some Measurements for Dairy Farms Designed to Provide \$3,000 and \$5,000 Returns to Labor and Investment, North Central Louisiana, (1958-59 Prices)**

| Item                                       | \$3,000 Level  |                | \$5,000 Level  |                |
|--------------------------------------------|----------------|----------------|----------------|----------------|
|                                            | Extensive Plan | Intensive Plan | Extensive Plan | Intensive Plan |
|                                            | (A)            | (B)            | (C)            | (D)            |
| Size                                       |                |                |                |                |
| Acres                                      | 78             | 46             | 119            | 74             |
| Herd (number)                              | 29             | 22             | 43             | 36             |
| Pasture                                    |                |                |                |                |
| Improved permanent (acres)                 | 19             | 22             | 30             | 36             |
| Unimproved permanent (acres)               | 15             |                | 22             |                |
| Temporary summer (acres)                   | 10             | 8              | 15             | 12             |
| Temporary winter (acres)                   | 19             | 16             | 30             | 25             |
| Feed crops                                 |                |                |                |                |
| Silage (acres)                             |                | 2              |                | 4              |
| Hay meadow (acres)                         | 22             | 2              | 22             | 4              |
| Out-of-pocket costs                        | \$ 3,677       | \$ 3,785       | \$ 5,676       | \$ 6,380       |
| Out-of-pocket costs<br>(plus depreciation) | \$ 4,125       | \$ 4,167       | \$ 6,340       | \$ 7,005       |
| Gross returns                              | \$ 7,169       | \$ 7,222       | \$11,473       | \$12,080       |
| Returns per head                           | \$104.96       | \$138.86       | \$119.37       | \$140.97       |
| Returns per acre                           | \$ 39.02       | \$ 66.41       | \$ 43.13       | \$ 68.58       |
| Cost per cwt. of milk                      | \$ 3.62        | \$ 3.54        | \$ 3.46        | \$ 3.51        |
| Investment                                 | \$26,952       | \$25,345       | \$34,356       | \$31,776       |

state and federal regulation in this area. Entry into dairy farming is somewhat restricted. At the present time, a farmer wishing to enter dairying must sell his milk the first year at a Class II price. As an example, if the gross returns of Model Dairy Farm C were computed on the basis of a Class II price of \$3.25 per hundredweight, the operator of Model Dairy Farm C would have to absorb a loss of \$933 for the first year. Further limitations to the entry of new producers are expected in the near future.

## The Cotton Enterprise

### General Description of the Sample of Cotton Farms

Cotton farms ranged in size from 126 acres to 440 acres. The reported acreage included rented cotton acreage on three of the six farms.

All of the farms were free of real estate debt. Only one farm operator had obtained a short-term loan during the year, and it amounted to only \$700.

Table 21 presents a general summary of the farms in the sample. Returns above out-of-pocket costs plus depreciation ranged from \$1,540 to \$5,481. On a per acre basis, net returns ranged from \$5.45 to \$16.16.

### Economic Evaluation of the Sample of Cotton Farms

An average of 69 percent of the gross income of the sample farmers was obtained from the cotton enterprise. Additional income was re-

**TABLE 21.—General Summary Table, Six Cotton Farms, North Central Louisiana, 1958-59**

| Farms                 | Net returns<br>to labor and<br>investment,<br>per farm | Net returns<br>to labor and<br>investment,<br>per acre | Acres<br>in farm | Total<br>investment |
|-----------------------|--------------------------------------------------------|--------------------------------------------------------|------------------|---------------------|
|                       | (Dollars)                                              | (Dollars)                                              | (Acres)          | (Dollars)           |
| One                   | 5,481                                                  | 12.46                                                  | 440              | 66,205              |
| Two                   | 4,444                                                  | 16.16                                                  | 275              | 35,021              |
| Three                 | 2,664                                                  | 9.48                                                   | 281              | 31,812              |
| Four                  | 1,745                                                  | 5.45                                                   | 320              | 37,024              |
| Five                  | 1,731                                                  | 13.74                                                  | 126              | 9,998               |
| Six                   | 1,540                                                  | 10.69                                                  | 144              | 19,070              |
| Average,<br>all farms | 2,934                                                  | 11.33                                                  | 264              | 33,188              |

ceived from beef, hogs, corn, timber, and truck crops. Four of the farmers also received income from oil leases and off-farm work.

Although the cotton enterprise represented the major source of income on the sample farms, it utilized only a small part of the total farm acreage. Actually, the sample farms had an average of approximately 3.2 acres of land not suitable for row crop production for every acre of land that could be planted to row crops.<sup>3</sup>

The basic weaknesses found in the land use program of the sample farmers may be listed as follows:

1. On many of the farms, land that had been taken out of cotton production because of government restrictions remained idle. This land could have been used for corn, beef, or hay production.
2. Much of the land unfit for crop production was not being used efficiently. Returns on all of the farms could have been increased through pasture, hay, and timber use.
3. The timbered land on three of the sample farms had been completely cutover and remained idle. This land could be productive if cleared for pasture or reforested.

## **A Hypothetical Model Cotton Farm Returning \$3,000 To Labor and Investment**

Since government restrictions limit the acreage that can be used for the production of cotton, it is unrealistic to attempt to contrast extensive and intensive methods of operation as was done in the analysis of the two previous enterprises.

The analysis of the sample cotton farms revealed that for each acre of cotton land there were approximately 1.96 acres of land suitable for row crops, 2.80 acres suitable for pasture, 2.96 acres in timber and 0.48 acre in wasteland and homestead area. Thus, the clue to maximum

<sup>3</sup>More detailed information concerning cotton farming can be found in D.A.E. Circular 297, Department of Agricultural Economics, Louisiana State University, February 1962.



returns from the farm unit is to make efficient use of this non-cotton acreage.

**Selection of Enterprises for Model Cotton Farm A** — Since the size of the model farm depends on the number of acres of land available for the production of cotton, the first major assumption in designing the model farm unit was to have an average 23-acre cotton allotment in keeping with the observed average on sample farms. Using this basic acreage and applying the ratio of other land to cotton, Model Farm A will consist of approximately 188 acres, as follows:

|                                     |           |
|-------------------------------------|-----------|
| Land suitable for row crops         | 45 acres  |
| Land suitable for pasture or timber | 64 acres  |
| Land in timber                      | 68 acres  |
| Wasteland, homestead, etc.          | 11 acres  |
| Total farm size                     | 188 acres |

Two of the enterprises were predetermined, i.e., 23 acres of cotton and 68 acres of timber. The major problem was to decide on a use for the 22 acres of fertile land suitable for row crop production and the 64 acres of relatively hilly and infertile land. Selection of enterprises to use this available land was confined to those enterprises found on the sample farms. It is reasonable to assume that in the past other supplementary enterprises have been considered and rejected for any one of several reasons, possibly lack of market outlets, excessive capital requirements, or labor needs.

The supplementary enterprises established on the six sample farms were corn, beef, hogs, and truck crops. Analysis of the truck crop enterprise revealed three major characteristics. First, it required extremely large amounts of labor. Second, it conflicted with the cotton enterprise in its needs for labor and, third, its market outlets were limited to local demand. The hog enterprise required better equipment and more farmer proficiency in the enterprise than was found on the sample farms.

The corn enterprise displayed a fairly consistent profit on all the sample farms. In addition, corn is a versatile product, as it can be readily stored or marketed through livestock.

The beef or timber enterprise would provide the best returns per acre from the relatively hilly, infertile land and would always have a fairly reliable market outlet. However, if a charge is not made for the farmer's labor, the beef enterprise supplemented by row crop residue and woodland pasture would bring higher returns on a per acre basis than the timber enterprise.

**Inputs for Cotton Farm Models** — The beef herd was assumed to consist of the same type animals as found on Model Beef Farm A with similar values applied.

Investment in barns, farm equipment, depreciation and miscellaneous charges were based on sample farms having the same enterprises as the beef farm models.

**Cotton Enterprise** — The fertilizer and yield data used were ob-

tained from the North Louisiana Hill Farm Experiment Station. Results of a five-year experiment at this station indicate that with an application of 500 pounds of 8-8-8, approximately 1,010 pounds of seed cotton can be obtained per acre.<sup>4</sup> All other data were obtained from the farm records of the six sample farms. Appendix Table 31 presents a summary of the estimated annual costs and returns per acre for cotton.

**Corn Enterprise** — The corn yield per acre is assumed to be 43 bushels and the price received \$1.10 per bushel. Prices, yields, and fertilizer applications are based on data obtained from the sample cotton farms. Appendix Table 32 presents a summary of the estimated annual costs and returns per acre of corn.

**Beef Enterprise** — Pasture requirements are the same as those of Model Beef Farm A. That is, approximately 1.5 acres of unimproved pasture and 0.6 acre of improved pasture are assumed to maintain each brood cow. The costs per acre are the same as those of the beef farmers, with the exception that fencing charges are removed. Fencing charges on the cotton farms are included as part of miscellaneous costs.

The winter ration of the herd consists of high protein Coastal Bermuda grass hay. However, it is assumed that the animals will obtain approximately 25 percent of their roughage requirements from crop residue and woodland pasture. Thus, only 1,875 pounds of Coastal Bermuda grass hay is needed per head. Approximately 0.2 acre of Coastal Bermuda grass hay meadow is needed to produce the required hay per head. Appendix Table 13 presents the estimated cost per acre of Coastal Bermuda grass hay. However, since the total amount of hay needed is small, it is assumed that the hay will be custom baled. Estimated total cost to produce and custom harvest an acre of Coastal Bermuda grass hay is \$96.44.

On the basis of acreage requirements per cow, the 64 acres of open land are divided into 46 acres of unimproved pasture, 18 acres of improved pasture, and 4 acres of hay meadow.

The costs and returns per head to be expected from the beef cattle enterprise are presented in Appendix Table 33. The type of brood cow, calving system, marketing weights of calves, and prices received are based on practices carried out by the sample of above-average beef cattle farmers.

**Timber Enterprise** — The timbered land is assumed to be the same as the representative woodlot selected and cruised by the North Louisiana Hill Farm Experiment Station forester. This woodlot produced approximately 130 board feet of sawlogs and 0.6 cord of pulpwood per acre annually.

**Labor Inputs** — Labor is not a limiting factor in the operation of model cotton farms. Available labor exceeds labor needs for all but two months of the year (Appendix Tables 34 and 35).

**Costs and Returns** — Capital investment required for Cotton Farms

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<sup>4</sup>North Louisiana Hill Farm Experiment Station, *1955 Annual Progress Report* (Homer: Louisiana Agricultural Experiment Station), p. 16.

A and B is given in Table 22. As with the sample cotton farms, the major investment items are land and equipment. However, a larger

**TABLE 22.—Estimated Investment Required for the Operation of Cotton Farms A and B, North Central Louisiana**

|                                          | Farm A |          | Farm B |          |
|------------------------------------------|--------|----------|--------|----------|
|                                          | Number | Value    | Number | Value    |
| Livestock                                |        |          |        |          |
| Brood cows @ \$150                       | 26     | \$ 3,900 | 41     | \$ 6,150 |
| Heifers @ \$ 75                          | 3      | 225      | 4      | 300      |
| Bulls @ \$500                            | 1      | 500      | 1      | 500      |
| Total livestock                          |        | \$ 4,625 |        | \$ 6,950 |
| Barns                                    |        | \$ 3,500 |        | \$ 3,500 |
| Land                                     |        |          |        |          |
| Open land (acres) @ \$108                | 109    | \$11,772 | 167    | \$18,036 |
| Timberland, homestead, etc. (acres) @ 60 | 79     | 4,740    | 121    | 7,260    |
| Total land                               |        | \$16,512 |        | \$25,296 |
| Farm equipment                           |        | 4,571    |        | 4,571    |
| Total capital investment                 |        | \$29,208 |        | \$40,317 |

**TABLE 23.—Estimated Costs and Returns of Cotton Farm A, North Central Louisiana, (1958-59 Prices)**

|                                         |                               |         |
|-----------------------------------------|-------------------------------|---------|
| Gross returns                           |                               |         |
| Cotton lint                             | 10,212 lbs. @ \$0.304         | \$3,104 |
| Cotton seed                             | 6.9 tons @ \$46.71            | 322     |
| Calves                                  | 20 (428 lbs.) @ \$0.22        | 1,883   |
| Cull cows                               | 2 (800 lbs.) @ \$0.14         | 224     |
| Corn                                    | 774 bushels @ \$1.10          | 851     |
| Timber                                  | 68 acres @ \$6.75             | 459     |
| Total gross returns                     |                               | \$6,843 |
| Costs                                   |                               |         |
| Cotton                                  | 23 acres @ \$77.39            | \$1,780 |
| Corn                                    | 18 acres @ \$23.89            | 430     |
| Improved pasture                        | 18 acres @ \$7.16             | 129     |
| Unimproved pasture                      | 46 acres @ \$ 1.21            | 56      |
| Hay meadow                              | 4 acres @ \$96.44             | 386     |
| Veterinary fees and medicine            | \$1.13 per animal unit (x 30) | 34      |
| Spray materials and worming             | 0.43 per animal unit (x 30)   | 13      |
| Salt and minerals                       | 0.22 per animal unit (x 30)   | 7       |
| Marketing                               | 4% of gross sales of animals  | 84      |
| Miscellaneous                           | farm unit                     | 385     |
| Depreciation                            | farm unit                     | 410     |
| Taxes                                   | \$0.23 an acre (x 188)        | 43      |
| Total cash plus depreciation costs      |                               | \$3,757 |
| Net returns to labor and investment     |                               | \$3,086 |
| Net returns per acre                    |                               | \$ 16   |
| Interest on investment (4% of \$29,208) |                               | \$1,168 |
| Net returns to labor                    |                               | \$1,918 |

**TABLE 24.—Estimated Costs and Returns of Cotton Farm B, North Central Louisiana, (1958-59)**

|                                         |                               |                 |
|-----------------------------------------|-------------------------------|-----------------|
| <b>Gross returns</b>                    |                               |                 |
| Cotton lint                             | 15,540 lbs. @ \$0.304         | \$ 4,724        |
| Cotton seed                             | 10.5 tons @ \$46.71           | 490             |
| Calves                                  | 33 (428 lbs.) @ \$0.22        | 3,107           |
| Cull cows                               | 3 (800 lbs.) @ \$0.14         | 336             |
| Corn                                    | 1161 bushels @ \$1.10         | 1,277           |
| Timber                                  | 104 acres @ \$6.75            | 702             |
| Total gross returns                     |                               | <u>\$10,636</u> |
| <b>Costs</b>                            |                               |                 |
| Cotton                                  | 35 acres @ \$77.39            | \$ 2,709        |
| Corn                                    | 27 acres @ \$23.89            | 645             |
| Improved pasture                        | 28 acres @ \$ 7.16            | 200             |
| Unimproved pasture                      | 70 acres @ \$ 1.21            | 85              |
| Hay meadow                              | 7 acres @ \$96.44             | 675             |
| Veterinary fees and medicine            | \$1.13 per animal unit (x 46) | 52              |
| Spray materials and worming             | 0.43 per animal unit (x 46)   | 20              |
| Salt and minerals                       | 0.22 per animal unit (x 46)   | 10              |
| Marketing                               | 4% of gross sales of animals  | 137             |
| Miscellaneous costs                     | farm unit                     | 424             |
| Depreciation                            | farm unit                     | 490             |
| Taxes                                   | \$0.23 per acre (x 288 acres) | 66              |
| Total cash plus depreciation costs      |                               | <u>\$ 5,513</u> |
| Net returns to labor and investment     |                               | \$ 5,123        |
| Net returns per acre                    |                               | \$ 17.79        |
| Interest on investment (4% of \$40,317) |                               | \$ 1,613        |
| Net returns to labor                    |                               | <u>\$ 3,510</u> |

investment in livestock was assumed for the models than was actually found on the sample cotton farms. The increased investment in livestock is due to the higher grade animals on the model cotton farms. The market for the type of calves produced by the sample farmers is limited in most cases to local slaughter demand. The better quality calves produced on the model farm meet not only local slaughter requirements but also feeder-buyer requirements, thus widening the market outlet.

Tables 23 and 24 present summaries of the costs and returns of the model farms. On Farm A, cotton accounts for 45 percent of the total costs and 50 percent of the gross returns. On Farm B, the corresponding figures are 49 and 40 percent.

### **Hypothetical Model Cotton Farm Returning \$5,000 To Labor and Investment**

Cotton Farm B, designed to return \$5,000 to operator labor and investment, differs from Farm A only by the size of the cotton allotment. It is assumed that Cotton Farm B has a 35-acre cotton allotment. Using this basic acreage and applying the ratio of other land to cotton land, Farm B consists of 288 acres as follows:



|                         |           |
|-------------------------|-----------|
| Cotton                  | 35 acres  |
| Corn                    | 27 acres  |
| For beef cattle         | 105 acres |
| For timber              | 104 acres |
| Wasteland and homestead | 17 acres  |
|                         | <hr/>     |
| Total farm size         | 288 acres |

## Summary Comments

The major difference between the cotton farm models and the sample of six cotton farms is more intensive utilization of the land area. The enterprises are basically the same. Assumed yields in some cases are less, but every available acre capable of providing income is in production. Apparently the major problem of the cotton farmers is their failure to adjust the farm unit to the reduced cotton acreage. As a result, much of the land area remains idle.

The major conclusion that can be drawn from the survey data is that the cotton enterprise, when supplemented with suitable alternative enterprises, is still profitable in the North Central Louisiana area.

The data obtained from the sample farms indicate that, to maintain a profitable farm operation, a relatively large farm is needed. The model farms substantiate this. In addition to obtaining sufficient acreage, there is the problem of obtaining a cotton allotment. The United States Department of Agriculture Commodity Stabilization Service reports a 26 percent decrease in acreage covered by cotton allotments in the hill farm area from 1959 to 1960.<sup>5</sup>

Apparently cotton acreage restrictions will continue for some time to come, and the opportunity to develop new cotton farms in the North Central Louisiana area is very limited.

## The General or Diversified Farm Unit

### Description of General Farms in the Sample

Table 25 contains summary data for the six farms comprising the sample for this part of the study.

Only one farm was mortgaged and the mortgage was held by the father of the operator. Another operator had obtained a \$1,000 short-term loan from the local bank.

### Economic Evaluation of the Sample of General Farms

The type of enterprises found on the general farms depended on the number of acres suitable for row crop production and whether or not the farm had a cotton allotment. In general, the more acres available for row crop production, the more varied are the enterprises. Table

<sup>5</sup>United States Department of Agriculture Commodity Stabilization Service, *Louisiana Report of Programs Administered by State and Parish ASC Committees* (Alexandria, 1958-59 and 1959-60, Section 3, Table 1).

26 shows the total acreage and the number of acres suitable for row crop production for each farm. These data also show that, on the average, for every acre suitable for row crop use, there are 4.2 acres that are not suitable.

Table 27 reports the percentage of gross income derived from the various enterprises on the six general farms. Beef and hog enterprises were found on all sample farms. Other enterprises included timber, cotton, truck crops, corn, broilers, sheep, and harvested seed crops.

The principal criticism about the sample general farms is that available acreage was not utilized efficiently. Most farm operators concentrated on row crops and, in most cases, were receiving adequate returns

**TABLE 25.—Summary Table of the Six General Farms, North Central Louisiana, 1958-59**

| Farms                  | Net returns<br>to labor and<br>investment,<br>per farm | Net returns<br>to labor and<br>investment,<br>per acre | Farm<br>size | Total<br>investment |
|------------------------|--------------------------------------------------------|--------------------------------------------------------|--------------|---------------------|
|                        | (Dollars)                                              | (Dollars)                                              | (Acres)      | (Dollars)           |
| One                    | 2,631                                                  | 6.36                                                   | 414          | 61,125              |
| Two                    | 2,169                                                  | 20.86                                                  | 104          | 26,909              |
| Three                  | 2,048                                                  | 2.38                                                   | 860          | 123,581             |
| Four                   | 1,317                                                  | 4.24                                                   | 310          | 33,460              |
| Five                   | 1,064                                                  | 5.85                                                   | 182          | 26,792              |
| Six                    | 599                                                    | 2.16                                                   | 276          | 31,446              |
| Average<br>(all farms) | 1,638                                                  | 6.98                                                   | 358          | 50,552              |

**TABLE 26.—Total Farm Acreage, Acreage Suitable for Row Crop Production, and Land Use Pattern, Six General Farms, North Central Louisiana, 1958-59**

| Item                                      | Farms   |     |       |      |      |     |
|-------------------------------------------|---------|-----|-------|------|------|-----|
|                                           | One     | Two | Three | Four | Five | Six |
|                                           | (Acres) |     |       |      |      |     |
| Total farm land                           | 414     | 104 | 860   | 310  | 182  | 276 |
| Acres suitable for<br>row crop production | 139     | 24  | 209   | 36   | 52   | 56  |
| Land use pattern                          |         |     |       |      |      |     |
| Beef                                      | 151     | 54  | 208   | 84   | 44   | 79  |
| Hog                                       | 33      | 4   | 25    | Lot  | 36   | 14  |
| Sheep                                     | ..      | ..  | ..    | ..   | ..   | 75  |
| Cotton                                    | 27      | ..  | 70    | ..   | ..   | 1   |
| Truck crops                               | ..      | ..  | ..    | 2    | 9    | 14  |
| Corn                                      | 26      | 9   | 15    | ..   | ..   | ..  |
| Harvested seed crops                      | 39      | ..  | 25    | ..   | ..   | ..  |
| Timber                                    | 126     | 33  | 406   | 210  | 85   | 76  |
| Idle                                      | ..      | ..  | 64    | ..   | ..   | ..  |
| Homestead, waste, etc.                    | 12      | 4   | 47    | 14   | 8    | 17  |

**TABLE 27.—Percent of Gross Returns Received from Various Farm Enterprises, Six General Farms, North Central Louisiana, 1958-59**

| Enterprise            | Farms     |     |       |      |      |     |
|-----------------------|-----------|-----|-------|------|------|-----|
|                       | One       | Two | Three | Four | Five | Six |
|                       | (Percent) |     |       |      |      |     |
| Beef                  | 20        | 9   | 29    | 29   | 33   | 37  |
| Hog                   | 8         | 38  | 5     | 10   | 35   | 13  |
| Timber                | 3         | 1   | 13    | 31   | ..   | ..  |
| Cotton                | 17        | ..  | 45    | ..   | ..   | 5   |
| Truck crops           | ..        | ..  | ..    | 1    | 28   | 32  |
| Corn                  | 10        | 2   | 4     | 5    | ..   | ..  |
| Broiler               | 34        | 33  | ..    | ..   | ..   | ..  |
| Sheep                 | ..        | ..  | ..    | ..   | ..   | 13  |
| Harvested seed crops* | 5         | ..  | 4     | ..   | ..   | ..  |
| Other income**        | 3         | 17  | ..    | 24   | 4    | ..  |
| Total                 | 100       | 100 | 100   | 100  | 100  | 100 |

\*Includes oats, crimson clover, and wheat.

\*\*Includes income from oil leases and off-farm work.

from this acreage, but the acreage not suitable for row crop enterprises was usually neglected.<sup>6</sup>

## Hypothetical Model General Farm Yielding \$3,000 To Labor and Investment

Only one diversified farm unit, General Farm A, was designed to return \$3,000 to operator labor and investment because the yields obtained by the sample farmers were as high as those obtained at the experiment stations. The only exception was the beef cattle enterprise, which was handled by a synthesis of both sample farm and recommended experiment station practices.

**Selection of Enterprises** — Table 28 shows net per acre returns above

<sup>6</sup>More detailed information concerning the organization and operation of general farms can be found in D.A.E. Circular 298, Department of Agricultural Economics, Louisiana State University, Baton Rouge, Louisiana, March 1962.

**TABLE 28.—Estimated Returns per Acre Above Out-of-Pocket Costs, Selected Farm Enterprises in the Louisiana Hill Farm Area, 1960**

| Farm enterprise                     | Net returns per acre |
|-------------------------------------|----------------------|
| Cotton                              | \$71.60              |
| Hog                                 | 33.91*               |
| Corn                                | 23.41                |
| Beef                                | 21.23**              |
| Timber (planted pine plantation)    | 9.58***              |
| Timber (mixed all age farm woodlot) | 6.75****             |

\*Based on data presented in Appendix Table 36.

\*\*Based on herd obtaining part of winter feed requirements from field residue and woodland grazing.

\*\*\*Source: F. L. Corty and J. J. Stevens, *Pine Planting and Profits* (Bulletin No. 525, Baton Rouge: Louisiana Agricultural Experiment Station, June 1959), Table 4, p. 11. Returns based on a 40-year rotation.

\*\*\*\*Based on yield obtained from a representative farm woodlot selected and cruised by the North Louisiana Hill Farm Experiment Station forester.

cash costs from the most practical enterprises in the North Louisiana Hill Farm area. Truck crops were not included because of limited market outlets. Wheat, oats, and crimson clover were not considered because the enterprises would be competitive with beef for land area, and the beef enterprise provides higher net returns per acre.

The contract broiler enterprise found on one sample farm displayed relatively high returns. Nevertheless, the contract broiler enterprise was not included in the model because returns to the enterprise require a relatively large investment in specialized equipment, and returns to the enterprise are entirely dependent upon the decisions of someone other than the farmer. The farmer could never be sure that his contract would be renewed. This enterprise conducted on an independent basis has not been very profitable. Likewise, the cotton enterprise was not included in the General Farm Model A because it was found that most low income farmers in the hill area did not have sufficient cotton acreage to economically justify cotton production. It is included, however, in General Farm Model B.

**Inputs for Model Diversified Farms A and B** — In designing the model diversified general farms, input-output data were obtained from the sample general farms, cotton farms, beef cattle farms, and experiment station publications. Inputs and outputs for each of the supplementary enterprises are discussed separately.

**Hog and Corn Enterprise** — It is assumed that Diversified Farm A would have a hog enterprise consisting of ten brood sows. Approximately 5 acres of pasture and 32 acres of corn are required for an operation of this size. Appendix Table 36 presents the estimated costs and returns for the hog enterprise. Corn is fed to the hogs as long as hog prices remain above \$14 per hundredweight. If hog prices fall below \$14 per hundredweight and corn prices remain at \$1.10 per bushel, corn is sold.

An additional 17 acres of corn is produced for sale on Farm A and 35 additional acres on Farm B. This corn will also serve as a source of feed for beef cattle and hogs in case of low crop yields or pasture failure. Appendix Table 32 presents the estimated costs and returns from the corn enterprise.

**Beef Cattle Enterprise** — The beef cattle enterprise of Diversified Farm A is carried out in the same manner as the beef cattle enterprise of Model Cotton Farm A. Appendix Tables 37 and 38 present the estimated costs and returns for the beef enterprise.

**Cotton Enterprise** — Cotton production data were obtained from the farm records of the sample farms. Appendix Table 31 presents a summary of the estimated annual costs and returns per acre for cotton.

**Timber Enterprise** — Timber acreage on Diversified Farm A includes 30 acres of even-aged loblolly pine, managed on a 40-year rotation, plus 58 acres of mixed stand woodlot. On Farm B the corresponding acreages are 60 and 71, respectively.

**Labor Inputs** — Labor requirement is not a serious problem on the



model diversified farms. Actually, the major problem is to find some alternative use for excess labor (Appendix Tables 39 and 40). Additional labor is generally needed one month out of the year, for corn and cotton harvest.

## Hypothetical Model Diversified Farm Returning \$5,000 To Labor and Investment

Diversified Farm B was designed to return approximately \$5,000 to operator labor and investment. Farm B has the same basic enterprises as Farm A, plus a cotton enterprise. Cotton was added because most of the larger general farms in the hill farm area have a cotton allotment. The average-size cotton allotment for all farms in the hill farm area of North Central Louisiana was eight acres at the time of this study.<sup>7</sup>

The investment required for the two diversified farm models is given in Table 29 and a summary of the costs and returns is given in Tables 30 and 31, respectively.

The two diversified farm plans discussed in this section represent a synthesis of the most profitable enterprises that exist in the North Central Louisiana area, based on 1958-59 prices. The major difference between the model farms and the sample farms is the more complete

<sup>7</sup>United States Department of Agriculture Commodity Stabilization Service, *op. cit.*, Section III, Table 1.

**TABLE 29.—Estimated Investment Required for the Operation of General Farm Models, North Central Louisiana, 1958-59 Prices**

|                                           | Farm A |          | Farm B |          |
|-------------------------------------------|--------|----------|--------|----------|
|                                           | Number | Value    | Number | Value    |
| <b>Livestock</b>                          |        |          |        |          |
| Brood cows @ \$150                        | 27     | \$ 4,050 | 41     | \$ 6,150 |
| Heifers @ \$150                           | 3      | 450      | 5      | 375      |
| Bulls @ \$500                             | 1      | 500      | 1      | 500      |
| Boars @ \$150                             | 1      | 150      | 1      | 150      |
| Sows @ \$ 62.50                           | 10     | 625      | 10     | 625      |
| Total livestock                           |        | \$ 5,775 |        | \$ 7,800 |
| <b>Barns</b>                              |        |          |        |          |
| Farrowing pen                             |        | \$ 2,275 |        | \$ 2,275 |
|                                           |        | 425      |        | 425      |
| Total buildings                           |        | \$ 2,700 |        | \$ 2,700 |
| <b>Land</b>                               |        |          |        |          |
| Open (acres) @ \$111                      | 124    | \$13,764 | 197    | \$21,867 |
| Woodland, homestead, etc. (acres) @ \$ 69 | 100    | \$ 6,900 | 136    | \$ 9,384 |
| Total land                                |        | \$20,664 |        | \$31,251 |
| Farm equipment                            |        | \$ 3,298 |        | \$ 3,298 |
| Hog equipment                             |        | \$ 205   |        | \$ 205   |
| Total capital investment                  |        | \$32,642 |        | \$45,254 |

**TABLE 30.—Estimated Costs and Returns of General Farm A, North Central Louisiana, (1958-59 Prices)**

|                                                |                          |                |
|------------------------------------------------|--------------------------|----------------|
| <b>Gross returns</b>                           |                          |                |
| Calves                                         | 89.9 cwt. @ \$22         | \$1,978        |
| Cull cows                                      | 16.0 cwt. @ \$14         | 224            |
| Hogs                                           | 160.0 cwt. @ \$18        | 2,880          |
| Corn                                           | 731 bushels @ \$1.10     | 804            |
| Timber                                         | 58 acres @ \$6.75        | 392            |
|                                                | 30 acres @ \$9.58        | 287            |
| <b>Total returns</b>                           |                          | <b>\$6,565</b> |
| <b>Costs</b>                                   |                          |                |
| Corn                                           | 17 acres @ \$23.89       | \$ 406         |
| Beef                                           | *                        | 716            |
| Hogs                                           | **                       | 1,625          |
| Miscellaneous costs                            | farm unit                | 332            |
| Depreciation                                   | farm unit                | 389            |
| Taxes                                          | 15c per acre (224 acres) | 34             |
| <b>Total cash plus depreciation costs</b>      |                          | <b>\$3,502</b> |
| <b>Net returns to labor and investment</b>     |                          | <b>\$3,063</b> |
| Net returns per acre                           |                          | \$13.67        |
| Interest on investment (4 percent of \$32,642) |                          | \$1,306        |
| <b>Net returns to labor</b>                    |                          | <b>\$1,757</b> |

\*See Appendix Table 37 for details.

\*\*See Appendix Table 36 for details.

**TABLE 31.—Estimated Costs and Returns of General Farm B, North Central Louisiana, (1958-59 Prices)**

|                                                 |                                        |                 |
|-------------------------------------------------|----------------------------------------|-----------------|
| <b>Gross returns</b>                            |                                        |                 |
| Calves                                          | 137.0 cwt. @ \$22                      | \$ 3,014        |
| Cows                                            | 24.0 cwt. @ \$14                       | 336             |
| Hogs                                            | 160 cwt. @ \$18                        | 2,880           |
| Cotton lint                                     | 3,552 lbs. @ \$0.304                   | 1,080           |
| Cottonseed                                      | 2.4 tons @ \$46.71                     | 112             |
| Corn                                            | 1,505 bushels @ \$1.10                 | 1,656           |
| Timber                                          | 60 acres planted pine @ \$9.58         | 575             |
|                                                 | 71 acres all age mixed forest @ \$6.75 | 479             |
| <b>Total gross returns</b>                      |                                        | <b>\$10,037</b> |
| <b>Costs</b>                                    |                                        |                 |
| Cotton                                          | 8 acres @ \$77.39                      | 619             |
| Corn                                            | 35 acres @ \$23.89                     | 836             |
| Beef                                            | *                                      | 1,072           |
| Hogs                                            | **                                     | 1,625           |
| Miscellaneous costs                             | farm unit                              | 413             |
| Taxes                                           | \$0.15 per acre (333 acres)            | 50              |
| <b>Total cash costs plus depreciation</b>       |                                        | <b>\$5,004</b>  |
| <b>Net returns to labor and investment</b>      |                                        | <b>\$5,033</b>  |
| Net returns per acre                            |                                        | \$ 15           |
| Interest on investment (4 percent of \$45,254)) |                                        | \$1,810         |
| <b>Net returns above interest on investment</b> |                                        | <b>\$3,223</b>  |

\*See Appendix Table 37 for details.

\*\*See Appendix Table 36 for details.

utilization of every acre of land on the model farms. It is again emphasized that, for profitable farming in the hill farm area of North Central Louisiana, every available acre must be utilized in a more efficient manner.

The one major advantage of the diversified farm unit over the other types discussed in this study is that a drastic decrease in the price of one product would not lower income to as great an extent as on those farms specializing in one disadvantaged enterprise. A complete cotton crop failure, for example, would reduce income on General Farm B by 11 percent and on Cotton Farm B by 51 percent.

## Summary

From 1954 to 1959, the total number of farms in the hill farm area decreased by 43 percent. Farmers, businessmen, and potential landowners want to know what resources are necessary for successful farming in an area that is rapidly losing many of its farms.

The general purpose of this study was to determine what allocation of resources, or better proportioning of factors of production, is needed to have profitable open land farming in the hill farm areas of Louisiana. Specifically, this study tried to determine what combination of resources would be necessary to provide the hill farmer a return of \$3,000, or \$5,000, for his labor and investment in four major farm types, i.e., beef, dairy, cotton, and general farming.

The analysis was based on data collected from 24 better-than-average resident farmers who obtained not less than 75 percent of gross income from the farm unit.

### Beef

Analysis of the sample beef cattle farms showed that many beef enterprises survived because they were not burdened by real estate debt. Both the sample farms and the model farms indicated that large acreages are needed to obtain an adequate income from a specialized beef cattle operation. Sample farms averaged 440 acres. The model farm at the \$3,000 income level, using intensive practices, required slightly more than 230 acres and fixed capital investment in excess of \$60,000; and at the \$5,000 income level, required more than 365 acres and fixed capital investment in excess of \$90,000.

### Dairy

The dairy enterprise is a relatively profitable enterprise at prevailing prices. Analysis showed, however, that farms in the survey sample were conducting dairy operations in an extensive manner. Comparison of the extensive model dairy farms with the intensive models indicated that the dairy enterprise is well adapted to intensive operation. The extensive models require more land, capital, and labor to obtain the same level of income as the intensive model. The extensive model at the

\$3,000 income level required 78 acres of land and a fixed capital investment of \$26,952, while at the \$5,000 income level, 119 acres of land and a fixed capital investment of \$34,356 were needed. The intensive model at the \$3,000 income level required only 46 acres of land and a capital investment of \$25,345, but to obtain \$5,000 required 74 acres of land and a fixed capital investment of \$31,776.

Although the analysis indicates that an adequate return on investment can be obtained, even when a charge is made for operator's labor, entry into the dairy enterprise in this area is subject to state and federal regulation. Even more stringent limitations to the entry of new producers are expected in the near future.

## **Cotton**

Analysis of the cotton farms showed that the cotton enterprise supplemented by other enterprises is still profitable at current support prices. Most farmers in the survey sample, however, had not adjusted the farm unit to the reduction in cotton acreage, and much of the land area was not being efficiently utilized.

The model cotton farm designed to return \$3,000 to operator labor and investment required 188 acres of land and a fixed capital investment of \$29,208. The farm model designed to return \$5,000 to operator labor and investment required 288 acres and a capital investment of \$40,317. Acreage restrictions, however, limit the entry of new cotton farmers.

## **General or Diversified Farms**

Analysis of the general farms revealed that the enterprises yielding the largest returns per acre, in order of importance, were: cotton, hogs, corn, beef, and timber. Apparently, farmers placed too much emphasis on the cotton and corn enterprises and not enough emphasis on hog, beef, and timber enterprises.

Net returns per acre were highest for the dairy enterprise, followed by cotton, general farms, and beef. Of the four major farm types considered here, beef and general farming are the only ones not hampered by state and federal restraints against entry.

## **Conclusions**

Data presented in this study indicate that the principal factors contributing to the success of the sample farms were (1) good managerial ability and (2) the debt-free ownership of a large land area.

The need for a large land area is primarily due to the topography and fertility level of the soil. For each acre of crop land suitable for intensive farming there are approximately 4 acres of land suitable only for pasture, timber, or other extensive use.

Census data indicate that more than 60 percent of the farms in the area are less than 100 acres in size (Table 32). The many small farm



TABLE 32.—Farms by Size, North Central Louisiana, 1959

| Farm size          | Number of farms | Percent of farms | Accumulative total<br>(Percent) |
|--------------------|-----------------|------------------|---------------------------------|
| Under 10 acres     | 436             | 7.5              | 7                               |
| 10 to 49 acres     | 1,850           | 31.1             | 38                              |
| 50 to 99 acres     | 1,352           | 22.6             | 61                              |
| 100 to 179 acres   | 1,202           | 20.1             | 81                              |
| 180 to 259 acres   | 424             | 7.1              | 88                              |
| 260 to 499 acres   | 402             | 6.7              | 95                              |
| 500 acres and over | 294             | 4.9              | 100                             |
| Total              | 5,960           | 100.0            |                                 |

Source: United States Bureau of the Census, *Census of Agriculture - Preliminary Series AC 59-1* (Washington, D. C.: United States Government Printing Office, December 1960), p. 1.

units must be consolidated if open land farming is to continue. Consolidation, however, is not easy. It is estimated that less than 25 percent of the land area still remains open. Much of this land consists of small tracts isolated by large forested areas. Another obstacle to consolidation is the speculative high land values which exceed the value justified by the agricultural productivity of the land.

Although open land farming has been considerably curtailed in the North Central Louisiana area, the many dairy farms in existence can operate profitably as long as milk prices retain their present relationship to costs. On the same basis, farms with large cotton allotments will continue to be successful. Large general farms offer the best possibilities for continued successful farming in the area. Diversified farm units can withstand economic adversity much better than farm units with a single enterprise. Many small, isolated farm units will become idle, or revert to timber. Others must be consolidated into economical units as indicated by the hypothetical models presented in this report.

## APPENDIX TABLES

**APPENDIX TABLE 1.—Annual Cost of Purchased Feeds and Home-grown Feeds per Pound of Available T.D.N., Six Beef Cattle Farms, North Central Louisiana, 1958-59\***

| Feed             | Farms               |      |       |      |      |      |
|------------------|---------------------|------|-------|------|------|------|
|                  | One                 | Two  | Three | Four | Five | Six  |
|                  | (Dollars per pound) |      |       |      |      |      |
| Purchased feeds  |                     |      |       |      |      |      |
| Cottonseed meal  | . 05                | . 05 | ..    | . 05 | . 05 | . 05 |
| Corn             | ..                  | ..   | ..    | .018 | ..   | ..   |
| Hay              | ..                  | ..   | ..    | .025 | .030 | ..   |
| Home-grown feeds |                     |      |       |      |      |      |
| Corn             |                     | .010 | .009  | .009 | .009 | .021 |
| Oat hay**        | .005                | .006 |       | .008 |      |      |
| Grass hay        | .003                | .006 | .012  | .008 | .010 | .010 |

\*Does not include cost of operator or family labor.

\*\*The cost of producing oat hay includes the farmers' estimate of harvesting cost and the cost of the final application of nitrogen.

**APPENDIX TABLE 2.—Pounds of Digestible Protein Available per Head in the Winter Ration from Feeds Other Than Cottonseed Meal, Six Beef Cattle Farms, North Central Louisiana, 1958-59\***

| Item                      | Farms    |     |       |      |      |     |
|---------------------------|----------|-----|-------|------|------|-----|
|                           | One      | Two | Three | Four | Five | Six |
|                           | (Pounds) |     |       |      |      |     |
| Corn, cob, and shuck meal | ..       | 28  | 40    | 133  | 72   | 76  |
| Grass hay                 | 68       | 52  | 73    | 27   | 39   | 40  |
| Oat hay                   | 94       | 105 | ..    | 70   | ..   | ..  |
| Total                     | 162      | 185 | 113   | 230  | 111  | 116 |

\*The National Research Council recommends 97.6 pounds of digestible protein for a 1,000-pound wintering pregnant cow.

**APPENDIX TABLE 3.—Annual Miscellaneous Costs, Six Beef Cattle Farms, North Central Louisiana, 1958-59**

| Item                         | Farms     |     |       |      |      |     |
|------------------------------|-----------|-----|-------|------|------|-----|
|                              | One       | Two | Three | Four | Five | Six |
|                              | (Dollars) |     |       |      |      |     |
| Veterinary fees and medicine | 57        | 29  | 113   | 64   | 56   | 51  |
| Spray materials              | 6         | 24  | 47    | 37   | 15   | 6   |
| Truck and auto expense       | 501       | 433 | 735   | 390  | 311  | 97  |
| Repairs to farm equipment    | 81        | 94  | 240   | 170  | 48   | 38  |
| Breeding fees                | ..        | 18  | ..    | ..   | ..   | 20  |
| Hauling charges              | 7         | ..  | 17    | 60   | ..   | ..  |
| Other*                       | 33        | 22  | 44    | 35   | ..   | ..  |
| Total                        | 685       | 620 | 1,196 | 756  | 489  | 239 |

\*Includes telephone, electricity, feed grinding, registration of livestock, salt, minerals, and extra fuel oil and grease.

**APPENDIX TABLE 4.—Fertilizer Application and Yield from Corn Acreage, Four Beef Cattle Farms, North Central Louisiana, 1958-59**

| Farms*                    | Fertilizer | Pounds | Yield per acre<br>(bushels) |
|---------------------------|------------|--------|-----------------------------|
| Two                       | N          | 79     |                             |
|                           | P          | 48     | 50                          |
|                           | K          | 48     |                             |
| Four                      | N          | 66     |                             |
|                           | P          | 24     | 38                          |
|                           | K          | 24     |                             |
| Five                      | N          | 79     |                             |
|                           | P          | 20     | 40                          |
|                           | K          | 20     |                             |
| Six                       | N          | 41     |                             |
|                           | P          | 24     | 45                          |
|                           | K          | 24     |                             |
| Average all<br>four farms | N          | 66     |                             |
|                           | P          | 29     | 43                          |
|                           | K          | 29     |                             |

\*Corn yields on Farms One and Three were above average, because of previous applications of chicken manure.

**APPENDIX TABLE 5.—Fertilizer Application and Yield from Hay Meadows, Four Beef Cattle Farms, North Central Louisiana, 1958-59**

| Farms*                    | Fertilizer | Pounds | Yield per acre<br>(tons) |
|---------------------------|------------|--------|--------------------------|
| Three                     | N          | 51     |                          |
|                           | P          | 36     | 1.4                      |
| Four                      | N          | 67     |                          |
|                           | P          | 0      | 1.7                      |
|                           | K          | 0      |                          |
| Five                      | N          | 32     |                          |
|                           | P          | 18     | 1.8                      |
|                           | K          | 18     |                          |
| Six                       | N          | 50     |                          |
|                           | P          | 53     | 2.0                      |
|                           | K          | 53     |                          |
| Average all<br>four farms | N          | 50     |                          |
|                           | P          | 27     | 1.7                      |
|                           | K          | 27     |                          |

\*The hay yields on Farms One and Two were above those of the other farms, because of the proximity of the hay meadows to creek bottoms.

**APPENDIX TABLE 6.—Estimated Annual Cost of Producing Corn, Extensive Type of Farm, North Central Louisiana, (1958-59 Prices)**

| Item             | Amount | Cost per unit | Cost per acre |
|------------------|--------|---------------|---------------|
|                  |        | (Dollars)     |               |
| Seed (pounds)    | 7      | 0.21          | 1.47          |
| Fertilizer       |        |               |               |
| N (pounds)       | 66     | 0.12          | 7.92          |
| P (pounds)       | 29     | 0.09          | 2.61          |
| K (pounds)       | 29     | 0.07          | 2.03          |
| Labor            |        |               |               |
| Operator* (hrs.) | 8.0    | ..            | ..            |
| Hired** (hrs.)   | 8.0    | 0.50          | 4.00          |
| Tractor (hrs.)   | 8.0    | 0.59          | 4.72          |
| Total cost       |        |               | 22.75         |

\*No charge is made for the operator's labor.

\*\*Labor is hired to harvest the crops.

**APPENDIX TABLE 7.—Estimated Cost to Establish Common Bermuda Pasture Mixture, Extensive Farm Plan, North Central Louisiana, (1958-59 Prices)**

| Item                    | Amount | Cost per unit | Cost per acre |
|-------------------------|--------|---------------|---------------|
|                         |        | (Dollars)     |               |
| Seed                    |        |               |               |
| Kobe lespedeza (pounds) | 25     | 0.24          | 6.00          |
| Crimson clover (pounds) | 12     | 0.30          | 3.60          |
| Fertilizer              |        |               |               |
| N (pounds)              | 16     | 0.12          | 1.92          |
| P (pounds)              | 16     | 0.09          | 1.44          |
| K (pounds)              | 16     | 0.07          | 1.12          |
| Lime (tons)             | 1      | 6.50          | 6.50          |
| Labor                   |        |               |               |
| Operator* (hrs.)        | 1.6    | ..            | ..            |
| Tractor (hrs.)          | 1.6    | 0.59          | 0.94          |
| Total cost**            |        |               | 21.52         |

\*No charge is made for operator's labor.

\*\*Under the cost-share arrangement \$11.00 of the total cost will be paid by the Agricultural Conservation Program.



**APPENDIX TABLE 8.—Estimated Annual Cost per Acre of Maintaining a Common Bermuda Pasture Mixture, Extensive Type of Farm, North Central Louisiana, (1958-59 Prices)**

| Item               | Amount | Cost per unit | Cost per acre |
|--------------------|--------|---------------|---------------|
|                    |        |               | (Dollars)     |
| Fertilizer         |        |               |               |
| N (pounds)         | 16     | 0.12          | 1.92          |
| P (pounds)         | 16     | 0.09          | 1.44          |
| K (pounds)         | 16     | 0.07          | 1.12          |
| Labor              |        |               |               |
| Operator* (hrs.)   | 0.5    |               |               |
| Tractor (hrs.)     | 0.5    | 0.59          | 0.30          |
| Clipping**         |        |               | 0.28          |
| Fencing***         |        |               | 0.34          |
| Prorated costs**** |        |               | 2.10          |
| Total annual costs |        |               | <u>7.50</u>   |

\*No charge is made for operator's labor.

\*\*Clipping charge is an average of clipping costs of Six Beef Cattle Farms.

\*\*\*Fencing charge is an average of fencing costs of Six Beef Cattle Farms.

\*\*\*\*Prorated charge is the establishment cost prorated over five years.

**APPENDIX TABLE 9.—Estimated Annual Cost of Maintaining an Acre of Unimproved Pasture and Woodland Pasture, Extensive Farm Plan, North Central Louisiana, (1958-59 Prices)**

| Pasture            | Cost per acre |
|--------------------|---------------|
|                    | (Dollars)     |
| Unimproved pasture |               |
| Clipping*          | 0.28          |
| Fencing**          | 0.34          |
| Prorated cost ***  | 0.93          |
| Total              | <u>1.55</u>   |
| Woodland pasture   |               |
| Fencing**          | 0.34          |

\*Clipping charge is an average of clipping costs of Six Beef Cattle Farms.

\*\*Fencing charge is an average of fencing costs of Six Beef Cattle Farms.

\*\*\*Prorated charge is cost of applying one ton of lime prorated over seven years.

**APPENDIX TABLE 10.—Estimated Annual Cost per Acre of Producing Common Bermuda Hay, Extensive Type of Farm, North Central Louisiana, (1958-59 Prices)**

| Item                      | Amount | Cost per unit | Cost per acre |
|---------------------------|--------|---------------|---------------|
|                           |        |               | (Dollars)     |
| Fertilizer                |        |               |               |
| N (pounds)                | 50     | 0.12          | 6.00          |
| P (pounds)                | 27     | 0.09          | 2.43          |
| K (pounds)                | 27     | 0.07          | 1.89          |
| Labor                     |        |               |               |
| Operator* (hrs.)          | 2.6    |               |               |
| Hired** (hrs.)            | 3.7    | 0.50          | 1.85          |
| Tractor and baler (hours) | 3.4    | 0.59          | 2.01          |
| Twine                     |        |               | 1.80          |
| Total cost                |        |               | <u>15.99</u>  |

\*No charge is made for the operator's labor.

\*\*Labor is hired for the hay harvesting operation.

**APPENDIX TABLE 11.—Total Hours of Labor Used Monthly, Farm A, North Central Louisiana (Extensive Plan)**

| Months    | Feeding | Feed crops<br>and<br>pasture | Other* | Total   |
|-----------|---------|------------------------------|--------|---------|
|           |         | (Hours)                      |        |         |
| January   | 42      | ..                           | 5.2    | 47.2    |
| February  | 42      | ..                           | ..     | 42.0    |
| March     | ...     | 94.6                         | 18.4   | 113.0   |
| April     | ...     | 65.4                         | ..     | 65.4    |
| May       | ...     | ..                           | 6.1    | 6.1     |
| June      | ...     | 430.0                        | 6.1    | 436.1   |
| July      | ...     | ...                          | 89.9   | 89.9    |
| August    | ...     | ...                          | 89.9   | 89.9    |
| September | ...     | 137.6                        | ...    | 137.6   |
| October   | ..      | ...                          | 65.4   | 65.4    |
| November  | 42      | ...                          | ...    | 42.0    |
| December  | 42      | ...                          | ...    | 42.0    |
| Total     | 168     | 727.6                        | 281.0  | 1,176.6 |

\*"Other" consists of labor for castrating, spraying, worming, vaccination, pasture clipping, and fence upkeep.

**APPENDIX TABLE 12.—Estimated Annual Cost per Acre of Maintaining a Coastal Bermuda Pasture Mixture, Intensive Farm Plan, North Central Louisiana, (1958-1959 Prices)**

| Item                      | Amount | Cost per<br>unit | Cost per<br>acre |
|---------------------------|--------|------------------|------------------|
|                           |        | (Dollars)        |                  |
| Ryegrass (pounds)         | 10     | 0.11             | 1.10             |
| Ammonium nitrate (pounds) | 400    | 4.10             | 16.40            |
| 0-14-14 (pounds)          | 500    | 2.10             | 10.50            |
| Labor                     |        |                  |                  |
| Operator* (hrs.)          | 2.6    | ..               | ..               |
| Tractor (hrs.)            | 1.7    | 0.59             | 1.00             |
| Fencing**                 |        |                  | 0.34             |
| Clipping***               |        |                  | 0.28             |
| Prorated costs****        |        |                  | 5.59             |
| Total cost                |        |                  | 35.21            |

\*No charge is made for operator's labor.

\*\*Fencing charge is an average of fencing costs of Six Beef Cattle Farms.

\*\*\*Clipping charge is an average of clipping costs of Six Beef Cattle Farms.

\*\*\*\*Prorated charge is the establishment cost prorated over five years.

**APPENDIX TABLE 13.—Estimated Annual Cost per Acre of Producing Coastal Bermuda Hay, Intensive Farm Plan, North Central Louisiana, (1958-59 Prices)**

| Item              | Amount | Cost per unit | Cost per acre |
|-------------------|--------|---------------|---------------|
|                   |        |               | (Dollars)     |
| Fertilizer        |        |               |               |
| N (pounds)        | 400    | 0.12          | 48.00         |
| P (pounds)        | 100    | 0.09          | 9.00          |
| K (pounds)        | 100    | 0.07          | 7.00          |
| Labor             |        |               |               |
| Operator* (hrs.)  | 6.5    |               |               |
| Hired** (hrs.)    | 11.5   | 0.50          | 5.75          |
| Tractor (hrs.)    | 8.6    | 0.59          | 5.07          |
| Twine             |        |               | 8.98          |
| Prorated costs*** |        |               | 5.10          |
| Total cost        |        |               | 88.90         |

\*No charge is made for the operator's labor.

\*\*Labor is hired to load and unload hay.

\*\*\*Established cost prorated over five years.

**APPENDIX TABLE 14.—Estimated Annual Cost per Acre of Establishing a Coastal Bermuda Hay Meadow, Intensive Farm Plan, North Central Louisiana, (1958-59 Prices)**

| Item                         | Amount | Cost per unit | Cost per acre |
|------------------------------|--------|---------------|---------------|
|                              |        |               | (Dollars)     |
| Lime (tons)                  | 1      | 6.50          | 6.50          |
| 0-14-14 (pounds)             | 500    | 2.10          | 10.50         |
| Coastal Bermuda sprigs (bu.) | 10     | .65           | 6.50          |
| Ammonium nitrate (pounds)    | 400    | 4.10          | 16.40         |
| Labor                        |        |               |               |
| Operator* (hrs.)             | 9.3    |               |               |
| Tractor (hrs.)               | 4.7    | 0.59          | 2.77          |
| Total cost**                 |        |               | 42.60         |

\*No charge is made for operator's labor.

\*\*Under the cost-share arrangement \$14.65 will be paid by the Agricultural Conservation Program.

**APPENDIX TABLE 15.—Estimated Cost per Acre of Establishing a Coastal Bermuda Pasture Mixture, Intensive Farm Plan, North Central Louisiana, (1958-59 Prices)**

| Item                         | Amount | Cost per unit | Cost per acre |
|------------------------------|--------|---------------|---------------|
|                              |        |               | (Dollars)     |
| Limestone (tons)             | 1      | 6.50          | 6.50          |
| 0-14-14 (lbs.)               | 500    | 2.10          | 10.50         |
| Coastal Bermuda sprigs (bu.) | 10     | 0.65          | 6.50          |
| Ammonium nitrate (lbs.)      | 400    | 4.10          | 16.40         |
| White clover (lbs.)          | 3      | 0.86          | 2.58          |
| Ryegrass (lbs.)              | 10     | 0.11          | 1.10          |
| Labor* (hrs.)                | 10.3   |               |               |
| Tractor (hrs.)               | 4.7    | 0.59          | 2.77          |
| 2, 4-D (lbs.)                | 0.75   | 1.12          | 0.84          |
| Total cost**                 |        |               | 47.19         |

\*No charge is made for operator's labor.

\*\*Under the cost-share arrangement \$17.25 of the cost will be paid by the Agricultural Conservation Program.

**APPENDIX TABLE 16.—Total Hours of Labor Used Monthly, Farm B (Intensive Type), North Central Louisiana**

| Months    | Feeding | Feed crops<br>and<br>pasture | Other* | Total   |
|-----------|---------|------------------------------|--------|---------|
|           |         | (Hours)                      |        |         |
| January   | 77.1    | ...                          | 12.0   | 89.1    |
| February  | 77.1    | ...                          | ...    | 77.1    |
| March     | ...     | 19.7                         | 12.0   | 31.7    |
| April     | ...     | 82.0                         | 14.5   | 96.5    |
| May       | ...     | 206.6                        | 12.0   | 218.6   |
| June      | ...     | ...                          | 91.8   | 91.8    |
| July      | ...     | 288.6                        | 12.0   | 300.6   |
| August    | ...     | ...                          | 60.2   | 60.2    |
| September | ...     | 82.0                         | ...    | 82.0    |
| October   | ...     | 190.2                        | ...    | 190.2   |
| November  | 77.1    | ...                          | ...    | 77.1    |
| December  | 77.1    | ...                          | ...    | 77.1    |
| Total     | 308.4   | 869.1                        | 214.5  | 1,392.0 |

\*"Other" consists of labor used for castrating, spraying, worming, vaccinating, pasture clipping, and fence maintenance.

**APPENDIX TABLE 17.—Total Hours of Labor Used Monthly, Beef Farm C (Extensive Type), North Central Louisiana**

| Months    | Feeding | Feed crops<br>and<br>pasture | Other* | Total   |
|-----------|---------|------------------------------|--------|---------|
|           |         | (Hours)                      |        |         |
| January   | 76.0    | ...                          | 9.3    | 85.3    |
| February  | 76.0    | ...                          | ...    | 76.0    |
| March     | ...     | 164.0                        | 21.7   | 185.7   |
| April     | ...     | 117.8                        | ...    | 117.8   |
| May       | ...     | ...                          | 9.3    | 9.3     |
| June      | ...     | 781.2                        | 9.3    | 790.5   |
| July      | ...     | ...                          | 156.8  | 156.8   |
| August    | ...     | ...                          | 156.8  | 156.8   |
| September | ...     | 248.0                        | ...    | 248.0   |
| October   | ...     | ...                          | 118.0  | 118.0   |
| November  | 76.0    | ...                          | ...    | 76.0    |
| December  | 76.0    | ...                          | ...    | 76.0    |
| Total     | 304.0   | 1,311.0                      | 481.2  | 2,096.2 |

\*"Other" consists of labor used for castrating, spraying, worming, vaccinating, pasture clipping, and fence upkeep.



**APPENDIX TABLE 18.—Total Hours of Labor Used Monthly, Beef Farm D  
(Intensive Type), North Central Louisiana**

| Months    | Feeding | Feed crops<br>and<br>pasture | Other* | Total   |
|-----------|---------|------------------------------|--------|---------|
| (Hours)   |         |                              |        |         |
| January   | 134.8   | ...                          | 17.0   | 151.8   |
| February  | 134.8   | ..                           | ..     | 134.8   |
| March     | ...     | 28.5                         | 17.0   | 45.5    |
| April     | ...     | 142.0                        | 22.7   | 164.7   |
| May       | ...     | 359.1                        | 17.0   | 376.1   |
| June      | ...     | ..                           | 159.0  | 159.0   |
| July      | ...     | 501.1                        | 17.0   | 518.1   |
| August    | ...     | ...                          | 100.8  | 100.8   |
| September | ...     | 142.0                        | ...    | 142.0   |
| October   | ...     | 330.6                        | ...    | 330.6   |
| November  | 134.8   | ...                          | ...    | 134.8   |
| December  | 134.8   | ..                           | ...    | 134.8   |
| Total     | 539.2   | 1,503.3                      | 350.5  | 2,393.0 |

\*"Other" consists of labor used for castrating, spraying, worming, vaccinating, pasture clipping, and fence maintenance.

**APPENDIX TABLE 19.—Miscellaneous Costs, Six Dairy Farms, North Central Louisiana, 1958-59**

| Item                         | Farms |     |       |      |      |     |
|------------------------------|-------|-----|-------|------|------|-----|
|                              | One   | Two | Three | Four | Five | Six |
| (Dollars)                    |       |     |       |      |      |     |
| Veterinary fees and medicine | 140   | 73  | 135   | 85   | 49   | 30  |
| Spray materials              | 60    | 8   | 15    | 11   | 9    | 20  |
| Truck and auto               | 317   | 91  | 124   | 294  | 286  | 319 |
| Repairs to equipment         | 270   | 138 | 65    | 136  | 88   | ..  |
| Breeding fees                | 472   | 40  | 150   | 206  | ..   | 268 |
| Electricity and telephone    | 937   | 155 | 138   | 65   | 174  | 180 |
| Supplies                     | 200   | 11  | ..    | 32   | 17   | 60  |
| Farm insurance               | 346   | 62  | 24    | ..   | ..   | ..  |
| Land rent                    | ..    | ..  | 100   | ..   | ..   | 62  |
| Total                        | 1,742 | 578 | 751   | 829  | 623  | 939 |

**APPENDIX TABLE 20.—Estimated Annual Cost of Establishing and Maintaining an Acre of Oat Winter Pasture, Extensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item                      | Amount | Cost per unit | Total cost per acre |
|---------------------------|--------|---------------|---------------------|
| (Dollars)                 |        |               |                     |
| Seed                      |        |               |                     |
| Oats (bushels)            | 3      | 1.56          | 4.68                |
| Fertilizer                |        |               |                     |
| N (pounds)                | 96     | 0.12          | 11.52               |
| P (pounds)                | 47     | 0.09          | 4.23                |
| K (pounds)                | 47     | 0.07          | 3.29                |
| Labor*                    |        |               |                     |
| Operator (hours)          | 5.4    | ..            | ..                  |
| Hired** (hours)           | 5.0    | 0.50          | 2.50                |
| Tractor and baler (hours) | 6.6    | 0.59          | 3.89                |
| Twine                     |        |               | 1.49                |
| Fencing                   |        |               | 0.33                |
| Total annual cost         |        |               | 31.93               |

\*No charge is made for the operator's labor.

\*\*Labor is hired for the hay harvesting operation.

**APPENDIX TABLE 21.—Estimated Annual Cost of Establishing and Maintaining an Acre of Millet Temporary Summer Pasture, Extensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item              | Amount | Cost per unit | Total cost per acre |
|-------------------|--------|---------------|---------------------|
| (Dollars)         |        |               |                     |
| Seed              |        |               |                     |
| Millet (pounds)   | 29     | 0.10          | 2.90                |
| Fertilizer        |        |               |                     |
| N (pounds)        | 63     | 0.12          | 7.56                |
| P (pounds)        | 28     | 0.09          | 2.52                |
| K (pounds)        | 28     | 0.07          | 1.96                |
| Labor*            |        |               |                     |
| Operator (hours)  | 3.6    | ..            | ..                  |
| Tractor (hours)   | 3.6    | 0.59          | 2.12                |
| Fencing           |        |               | 0.33                |
| Total annual cost |        |               | 17.39               |

\*No charge is made for the operator's labor.

**APPENDIX TABLE 22.—Estimated Annual Cost to Establish an Acre of Common Bermuda Pasture Mixture, Extensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item                    | Amount | Cost per unit | Total cost per acre |
|-------------------------|--------|---------------|---------------------|
| (Dollars)               |        |               |                     |
| Seed                    |        |               |                     |
| Kobe lespedeza (pounds) | 25     | 0.24          | 6.00                |
| Crimson clover (pounds) | 12     | 0.30          | 3.60                |
| Fertilizer              |        |               |                     |
| N (pounds)              | 23     | 0.12          | 2.76                |
| P (pounds)              | 22     | 0.09          | 1.98                |
| K (pounds)              | 22     | 0.07          | 1.54                |
| Lime (tons)             | 1      | 6.50          | 6.50                |
| Labor                   |        |               |                     |
| Operator* (hours)       | 1.6    |               |                     |
| Tractor (hours)         | 1.6    | 0.59          | 0.94                |
| Total cost**            |        |               | 23.32               |

\*No charge is made for the operator's labor.

\*\*Under the cost-share arrangement \$11.81 of the total cost will be paid by the Agricultural Conservation Program.

**APPENDIX TABLE 23.—Estimated Annual Maintenance Cost Per Acre of Common Bermuda Pasture Mixture, Extensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item               | Amount | Cost per unit | Total cost per acre |
|--------------------|--------|---------------|---------------------|
| (Dollars)          |        |               |                     |
| Fertilizer         |        |               |                     |
| N (pounds)         | 23     | 0.12          | 2.76                |
| P (pounds)         | 22     | 0.09          | 1.98                |
| K (pounds)         | 22     | 0.07          | 1.54                |
| Labor              |        |               |                     |
| Operator* (hours)  | .5     |               |                     |
| Tractor (hours)    | .5     | 0.59          | 0.30                |
| Clipping**         |        |               | 0.39                |
| Fencing***         |        |               | 0.33                |
| Prorated cost **** |        |               | 2.30                |
| Total annual cost  |        |               | 9.60                |

\*No charge is made for the operator's labor.

\*\*Clipping charge is an average of clipping costs of five dairy farmers.

\*\*\*Fencing charge is an average of fencing costs of six dairy farmers.

\*\*\*\*Prorated charge is the establishment cost prorated over five years.

**APPENDIX TABLE 24.—Estimated Annual Cost of Maintaining an Acre of Unimproved Pasture and Woodland Pasture, Extensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Pasture            | Total cost<br>per acre<br>(Dollars) |
|--------------------|-------------------------------------|
| Unimproved pasture |                                     |
| Clipping*          | 0.39                                |
| Fencing**          | 0.33                                |
| Prorated cost***   | 0.93                                |
| Total              | 1.55                                |
| Woodland pasture   |                                     |
| Fencing            | 0.33                                |

\*Clipping charge is an average of clipping costs of five dairy farms.

\*\*Fencing charge is an average of fencing costs of six dairy farms.

\*\*\*Prorated charge is cost of applying one ton of lime prorated over seven years.

**APPENDIX TABLE 25.—Estimated Annual Cost of Establishing and Maintaining an Acre of Winter Temporary Pasture, Intensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item                    | Amount | Cost per<br>unit | Total cost<br>per acre<br>(Dollars) |
|-------------------------|--------|------------------|-------------------------------------|
| Seed                    |        |                  |                                     |
| Oats (bushels)          | 3      | 1.53             | 4.59                                |
| Ryegrass (pounds)       | 10     | 0.11             | 1.10                                |
| Crimson clover (pounds) | 10     | 0.30             | 3.00                                |
| Fertilizer              |        |                  |                                     |
| N (pounds)              | 100    | 0.12             | 12.00                               |
| P (pounds)              | 48     | 0.09             | 4.32                                |
| K (pounds)              | 48     | 0.07             | 3.36                                |
| Labor                   |        |                  |                                     |
| Operator (hours)        | 4.1    | ...              | ...                                 |
| Tractor (hours)         | 3.5    | 0.59             | 2.06                                |
| Fencing                 |        |                  | 0.33                                |
| Total planting cost     |        |                  | 30.76                               |
| Harvesting for silage*  |        |                  |                                     |
| Cutting (ton)           | 8.6    | 1.50             | 12.90                               |
| Hauling & unloading     |        |                  |                                     |
| Tractor (hours)         | 5.7    | 0.59             | 3.36                                |
| Labor** (hours)         | 2.9    | 0.50             | 1.45                                |
| Total harvesting cost   |        |                  | 17.71                               |

\*Adapted from C. M. Woolf, *Resource Requirements and Returns for a Family-Size Dairy Farm* (Unpublished Thesis, Baton Rouge: Louisiana State University, January 1960), p. 58.

\*\*Assumes 2.8 hours of harvesting labor supplied by operator.



**APPENDIX TABLE 26.—Estimated Annual Cost per Acre of Establishing and Maintaining a Millet Temporary Summer Pasture, Intensive Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item                   | Amount | Cost per unit | Total cost per acre |
|------------------------|--------|---------------|---------------------|
| (Dollars)              |        |               |                     |
| Seed                   |        |               |                     |
| Millet (pounds)        | 25     | 0.10          | 2.50                |
| Fertilizer             |        |               |                     |
| N (pounds)             | 100    | 0.12          | 12.00               |
| P (pounds)             | 48     | 0.09          | 4.32                |
| K (pounds)             | 48     | 0.07          | 3.36                |
| Labor                  |        |               |                     |
| Operator (hours)       | 3.6    |               |                     |
| Tractor (hours)        | 3.6    | 0.59          | 2.12                |
| Fencing                |        |               | 0.33                |
| Total planting cost    |        |               | 24.63               |
| Harvesting for silage* |        |               |                     |
| Cutting (ton)          | 11.6   | 1.50          | 17.40               |
| Hauling and unloading  |        |               |                     |
| Tractor (hours)        | 7.3    | 0.59          | 4.31                |
| Labor** (hours)        | 4.5    | 0.50          | 2.25                |
| Total harvesting cost  |        |               | 23.96               |

\*Adapted from C. M. Woolf, *Resource Requirements and Returns for a Family-Size Dairy Farm* (Unpublished Thesis, Baton Rouge: Louisiana State University, January 1960), p. 58.

\*\*Assumes 2.8 hours of harvesting labor supplied by operator.

**APPENDIX TABLE 27.—Monthly Labor Requirements for the Operation of Dairy Farm A, North Central Louisiana**

| Month     | Milking* | Pasture and hay | Other** | Total   |
|-----------|----------|-----------------|---------|---------|
| (Hours)   |          |                 |         |         |
| January   | 178.9    | ...             | 26.8    | 205.7   |
| February  | 178.9    | 7.0             | 26.8    | 212.7   |
| March     | 178.9    | 23.0            | 8.5     | 210.4   |
| April     | 178.9    | 16.0            | 8.1     | 203.0   |
| May       | 178.9    | 131.4           | 8.9     | 319.2   |
| June      | 178.9    | 196.6           | 8.9     | 384.4   |
| July      | 178.9    | 7.0             | 8.9     | 194.8   |
| August    | 178.9    | ...             | 24.2    | 203.1   |
| September | 178.9    | 70.4            | 9.3     | 258.6   |
| October   | 178.9    | ...             | 31.3    | 210.2   |
| November  | 178.9    | ...             | 26.8    | 205.7   |
| December  | 178.9    | 16.0            | 26.8    | 221.7   |
| Total     | 2,146.8  | 467.4           | 215.3   | 2,829.5 |

\*Includes all operations in the milking parlor.

\*\*Includes fence maintenance, pasture clipping, spraying, and feeding replacement heifers and dry cows.

**APPENDIX TABLE 28.—Monthly Labor Requirements for the Operation of Dairy Farm B, North Central Louisiana**

| Months    | Milking* | Pasture, hay,<br>and silage** | Other*** | Total   |
|-----------|----------|-------------------------------|----------|---------|
|           |          | (Hours)                       |          |         |
| January   | 148.8    | ...                           | 24.3     | 173.1   |
| February  | 148.8    | 14.0                          | 24.3     | 187.1   |
| March     | 148.8    | 57.6                          | 7.8      | 214.2   |
| April     | 148.8    | ...                           | 32.7     | 181.5   |
| May       | 148.8    | 73.8                          | 7.1      | 229.7   |
| June      | 148.8    | 51.5                          | 7.5      | 207.8   |
| July      | 148.8    | 37.3                          | 8.2      | 194.3   |
| August    | 148.8    | 35.0                          | 7.5      | 191.3   |
| September | 148.8    | 110.8                         | 8.1      | 267.7   |
| October   | 148.8    | 37.8                          | 7.5      | 194.1   |
| November  | 148.8    | 14.0                          | 24.3     | 187.1   |
| December  | 148.8    | ...                           | 40.3     | 189.1   |
| Total     | 1,785.6  | 431.8                         | 199.6    | 2,417.0 |

\*Includes all operations in the milking parlor.

\*\*Labor for cutting silage is not included. The silage cutting operation is assumed to be custom hired.

\*\*\*Includes fence maintenance, pasture clipping, spraying, and feeding replacement heifers and dry cows.

**APPENDIX TABLE 29.—Monthly Labor Requirements for the Operation of Dairy Farm C, North Central Louisiana**

| Month     | Milking* | Pasture<br>and hay | Other** | Total   |
|-----------|----------|--------------------|---------|---------|
|           |          | (Hours)            |         |         |
| January   | 237.9    | ...                | 33.5    | 271.4   |
| February  | 237.9    | 9.0                | 33.5    | 280.4   |
| March     | 237.9    | 29.0               | 10.6    | 277.5   |
| April     | 237.9    | 20.0               | 10.1    | 268.0   |
| May       | 237.9    | 164.3              | 11.1    | 413.3   |
| June      | 237.9    | 245.7              | 11.1    | 494.7   |
| July      | 237.9    | 9.0                | 11.1    | 258.0   |
| August    | 237.9    | ...                | 30.2    | 268.1   |
| September | 237.9    | 88.0               | 11.6    | 337.5   |
| October   | 237.9    | ...                | 39.1    | 277.0   |
| November  | 237.9    | ...                | 33.5    | 271.4   |
| December  | 237.9    | 20.0               | 33.5    | 291.4   |
| Total     | 2,854.8  | 585.0              | 268.9   | 3,708.7 |

\*Includes all operations in the dairy building.

\*\*Includes fence maintenance, pasture clipping, spraying, and feeding replacement heifers and dry cows.

**APPENDIX TABLE 30.—Monthly Labor Requirements for the Operation of Dairy Farm D, North Central Louisiana**

| Month     | Milking* | Pasture, hay,<br>and silage** | Other*** | Total   |
|-----------|----------|-------------------------------|----------|---------|
|           |          | (Hours)                       |          |         |
| January   | 186      | ...                           | 30.4     | 216.4   |
| February  | 186      | 17.5                          | 30.4     | 233.9   |
| March     | 186      | 72.0                          | 9.7      | 267.7   |
| April     | 186      | ...                           | 40.9     | 226.9   |
| May       | 186      | 92.2                          | 8.9      | 287.1   |
| June      | 186      | 64.4                          | 9.4      | 259.8   |
| July      | 186      | 46.6                          | 10.3     | 242.9   |
| August    | 186      | 43.8                          | 9.4      | 239.2   |
| September | 186      | 138.5                         | 10.1     | 334.6   |
| October   | 186      | 47.3                          | 9.4      | 242.7   |
| November  | 186      | 17.5                          | 30.4     | 233.9   |
| December  | 186      | ...                           | 50.4     | 236.4   |
| Total     | 2,232    | 539.8                         | 249.7    | 3,021.5 |

\*Includes all operations in the dairy building.

\*\*Labor for cutting silage is not included. The silage cutting operation is assumed to be custom hired.

\*\*\*Includes fence maintenance, pasture clipping, spraying, and feeding replacement heifers and dry cows.

**APPENDIX TABLE 31.—Estimated Annual Costs and Returns per Acre for the Cotton Enterprise, North Central Louisiana, (1958-59 Prices)**

| Item                             | Amount | Cost per<br>unit | Costs and<br>returns |
|----------------------------------|--------|------------------|----------------------|
|                                  |        |                  | (Dollars)            |
| <b>Costs</b>                     |        |                  |                      |
| Seed (pounds)                    | 26     | 0.09             | 2.34                 |
| Fertilizer                       |        |                  |                      |
| N (pounds)                       | 48     | 0.12             | 5.76                 |
| P (pounds)                       | 48     | 0.09             | 4.32                 |
| K (pounds)                       | 48     | 0.07             | 3.36                 |
| Insecticide (pounds)             | 56     | 0.08             | 4.48                 |
| Thinning and hoeing (days)       | 2.7    | 3.50             | 9.45                 |
| Harvesting (pounds)              | 1,010  | 0.032            | 32.32                |
| Ginning (pounds)                 | 444    | 0.02             | 8.88                 |
| Lime (prorated over seven years) |        |                  | 0.93                 |
| Labor (hours)                    | 9.4    | ..               | ..                   |
| Tractor (hours)                  | 9.4    | 0.59             | 5.55                 |
| Total cash expenses              |        |                  | 77.39                |
| <b>Returns</b>                   |        |                  |                      |
| Cotton lint (pounds)             | 444    | 0.304            | 134.98               |
| Cotton seed (tons)               | 0.3    | 46.71            | 14.01                |
| Total returns                    |        |                  | 148.99               |
| Net returns                      |        |                  | 71.60                |

**APPENDIX TABLE 32.—Estimated Annual Costs and Returns per Acre for the Corn Enterprise, Cotton Farms A and B, North Central Louisiana, (1958-59 Prices)**

| Item                             | Amount | Cost per unit | Costs and returns |
|----------------------------------|--------|---------------|-------------------|
| (Dollars)                        |        |               |                   |
| <b>Costs</b>                     |        |               |                   |
| Seed (pounds)                    | 10     | 0.22          | 2.20              |
| Fertilizer                       |        |               |                   |
| N (pounds)                       | 66     | 0.12          | 7.92              |
| P (pounds)                       | 30     | 0.09          | 2.70              |
| K (pounds)                       | 27     | 0.07          | 1.89              |
| Lime (prorated over seven years) |        |               | 0.93              |
| Labor (preharvest) (hours)       | 5.8    |               |                   |
| Tractor (preharvest) (hours)     | 5.8    | 0.59          | 3.42              |
| Labor (harvest) (hours)          | 8.0    | 0.50          | 4.00              |
| Tractor (harvest) (hours)        | 1.4    | 0.59          | .83               |
| Total cash expenses              |        |               | 23.89             |
| <b>Returns</b>                   |        |               |                   |
| Corn (bushels)                   | 43     | 1.10          | 47.30             |
| Net returns                      |        |               | 23.41             |

**APPENDIX TABLE 33.—Estimated Annual Costs and Returns per Head, Beef Enterprise, Cotton Farm Plans, North Central Louisiana, (1958-59 Prices)**

| Item                                | Amount | Cost per unit | Costs and returns |
|-------------------------------------|--------|---------------|-------------------|
| (Dollars)                           |        |               |                   |
| <b>Costs</b>                        |        |               |                   |
| Unimproved pasture (acres)          | 1.5    | 1.21          | 1.82              |
| Improved pasture (acres)            | 0.6    | 7.16          | 4.30              |
| Hay meadow (acres)                  | 0.2    | 96.44         | 19.29             |
| Salt (cwt.)                         | 0.1    | 1.49          | 0.15              |
| Minerals (cwt.)                     | 0.1    | 1.25          | 0.12              |
| Veterinary fees and medicine* (cow) | 1.0    | 1.13          | 1.13              |
| Spray materials and worming* (cow)  | 1.0    | 0.43          | 0.43              |
| Marketing (4% of gross sales)       |        |               | 2.82              |
| Total cash cost                     |        |               | 30.06             |
| <b>Returns**</b>                    |        |               |                   |
| Calves (cwt.)                       | 2.88   | 22.00         | 63.36             |
| Cull cows (cwt.)                    | 0.52   | 14.00         | 7.28              |
| Total returns                       |        |               | 70.64             |
| Net returns (per head)              |        |               | 40.58             |

\*Based on farm records of sample beef cattle farms.

\*\*Assumes an 8 percent replacement program, 3 percent death loss, and 90 percent calf crop.



**APPENDIX TABLE 34.—Estimated Monthly Labor Requirements for the Operation of Cotton Farm A, North Central Louisiana**

| Month     | Enterprise |       |           | Total   |
|-----------|------------|-------|-----------|---------|
|           | Cotton     | Corn  | Livestock |         |
|           | (Hours)    |       |           |         |
| January   | 16.2       | ...   | 14.9      | 31.1    |
| February  | 32.4       | 30.8  | 16.2      | 79.4    |
| March     | ...        | 21.7  | 14.3      | 36.0    |
| April     | 62.6       | 9.0   | 9.1       | 80.7    |
| May       | 273.5      | 25.3  | ...       | 298.8   |
| June      | 69.5       | 18.1  | 1.3       | 88.9    |
| July      | 46.4       | ...   | 33.2      | 79.6    |
| August    | ...        | ...   | 1.3       | 1.3     |
| September | 927.2      | 144.7 | ...       | 1,071.9 |
| October   | ...        | ...   | 39.0      | 39.0    |
| November  | ...        | ...   | 7.5       | 7.5     |
| December  | ...        | ...   | 14.9      | 14.9    |
| Total     | 1,427.8    | 249.6 | 151.7     | 1,829.1 |

**APPENDIX TABLE 35.—Estimated Monthly Labor Requirements for the Operation of Cotton Farm B, North Central Louisiana**

| Month     | Enterprise |       |           | Total   |
|-----------|------------|-------|-----------|---------|
|           | Cotton     | Corn  | Livestock |         |
|           | (Hours)    |       |           |         |
| January   | 26.6       | ...   | 22.9      | 49.5    |
| February  | 53.2       | 45.9  | 24.9      | 124.0   |
| March     | ...        | 32.4  | 22.0      | 54.4    |
| April     | 102.6      | 13.5  | 14.0      | 130.1   |
| May       | 448.4      | 37.8  | ...       | 486.2   |
| June      | 114.0      | 27.0  | 2.0       | 143.0   |
| July      | 76.0       | ...   | 51.0      | 127.0   |
| August    | ...        | ...   | 2.0       | 2.0     |
| September | 1,520.0    | 216.0 | ...       | 1,736.0 |
| October   | ...        | ...   | 60.0      | 60.0    |
| November  | ...        | ...   | 11.5      | 11.5    |
| December  | ...        | ...   | 22.9      | 22.9    |
| Total     | 2,340.8    | 372.6 | 233.2     | 2,946.6 |

**APPENDIX TABLE 36.—Estimated Costs and Returns, Hog Enterprise, General Farms, North Central Louisiana, (1958-59 Prices)<sup>1</sup>**

| Item                                                               | Amount | Price per unit | Total     |
|--------------------------------------------------------------------|--------|----------------|-----------|
|                                                                    |        |                | (Dollars) |
| Corn (hogged off) <sup>2</sup> (acres)                             | 17.5   | 19.06          | 333.55    |
| Pasture <sup>3</sup> (acres)                                       | 5.0    | 11.51          | 57.55     |
| Feed <sup>4</sup>                                                  |        |                |           |
| Corn (bushels)                                                     | 626    | .56            | 350.56    |
| Supplement (pounds)                                                | 7,290  | .052           | 379.08    |
| Starter (pounds)                                                   | 4,640  | .055           | 255.20    |
| Salt (cwt.)                                                        | 1.4    | 1.49           | 2.09      |
| Minerals (cwt.)                                                    | 6.3    | 1.25           | 7.87      |
| Vaccination (C.C.)                                                 | 1,600  | .016           | 25.60     |
| Veterinary and medicine <sup>5</sup> (head)                        | 80     | .84            | 67.20     |
| Depreciation charges of farrowing house and equipment <sup>6</sup> |        |                | 31.75     |
| Marketing charges (4% of gross sales of animals)                   |        |                | 115.00    |
| Total cash costs                                                   |        |                | 1,625.45  |
| Returns                                                            |        |                |           |
| Hogs <sup>7</sup> (cwt.)                                           | 160.0  | 18.00          | 2,880.00  |
| Net returns                                                        |        |                | 1,254.55  |

<sup>1</sup>Enterprise consists of 10 brood sows, 1 boar, 80 pigs.

<sup>2</sup>Assumes 1.75 acres of corn per head, producing 43 bushels per acre.

<sup>3</sup>Based on pastures of sample farms. Pasture mixture consists of rye grass and common Bermuda fertilized with 200 pounds of 3-12-12 per acre.

<sup>4</sup>Ration was designed to provide nutrient requirements set forth in D.A.E. Circular No. 256, Table 8.

<sup>5</sup>Based on cost per head incurred by sample general farms.

<sup>6</sup>Based on sample farms valuation of farrowing houses and equipment.

<sup>7</sup>Assumes a 20 percent death loss.

**APPENDIX TABLE 37.—Estimated Costs and Returns of Beef Enterprise, General Farm A, North Central Louisiana, (1958-59 Prices)\***

| Item                                     | Amount | Cost per unit | Costs and returns |
|------------------------------------------|--------|---------------|-------------------|
|                                          |        |               | (Dollars)         |
| Unimproved pasture (acres)               | 47     | 1.21          | 56.87             |
| Improved pasture (acres)                 | 19     | 7.16          | 136.04            |
| Hay meadow (acres)                       | 4      | 94.44         | 377.76            |
| Salt (cwt.)                              | 3.1    | 1.49          | 4.62              |
| Minerals (cwt.)                          | 3.1    | 1.25          | 3.88              |
| Veterinary fees and medicine** (cow)     | 3.1    | 1.13          | 35.03             |
| Spray materials and worming** (cow)      | 3.1    | .43           | 13.33             |
| Marketing (4% of gross sales of animals) |        |               | 88.07             |
| Total cash costs                         |        |               | 715.60            |
| Returns***                               |        |               |                   |
| Calves (cwt.)                            | 89.9   | 22.00         | 1,977.80          |
| Cull cows (cwt.)                         | 16.0   | 14.00         | 224.00            |
| Total returns                            |        |               | 2,201.80          |
| Net returns                              |        |               | 1,486.20          |

\*Enterprise consists of 25 brood cows, 3 replacement heifers, and 1 bull.

\*\*Based on records of sample beef cattle farms.

\*\*\*Assumes an 8 percent replacement program, 3 percent death loss, and 90 percent calf crop.

**APPENDIX TABLE 38.—Estimated Costs and Returns of Beef Enterprise, General Farm B, North Central Louisiana, (1958-59 Prices)\***

| Item                                 | Amount | Cost per unit | Costs and returns |
|--------------------------------------|--------|---------------|-------------------|
| (Dollars)                            |        |               |                   |
| Costs                                |        |               |                   |
| Unimproved pasture (acres)           | 70     | 1.21          | 84.70             |
| Improved pasture (acres)             | 28     | 7.16          | 200.48            |
| Hay meadow (acres)                   | 6      | 94.44         | 566.64            |
| Salt (cwt.)                          | 4.6    | 1.49          | 6.85              |
| Minerals (cwt.)                      | 4.6    | 1.25          | 5.75              |
| Veterinary fees and medicine** (cow) | 4.7    | 1.13          | 53.11             |
| Spray materials and worming** (cow)  | 4.7    | 0.43          | 20.21             |
| Marketing (4% of gross sales)        |        |               | 134.00            |
| Total cash costs                     |        |               | 1,071.74          |
| Returns***                           |        |               |                   |
| Calves (cwt.)                        | 137.0  | 22.00         | 3,014.00          |
| Cows (cull) (cwt.)                   | 24.0   | 14.00         | 336.00            |
| Total returns                        |        |               | 3,350.00          |
| Net returns                          |        |               | 2,278.26          |

\*Enterprise consists of 41 brood cows, 1 bull, and 37 calves.

\*\*Based on farm records of sample beef cattle farms.

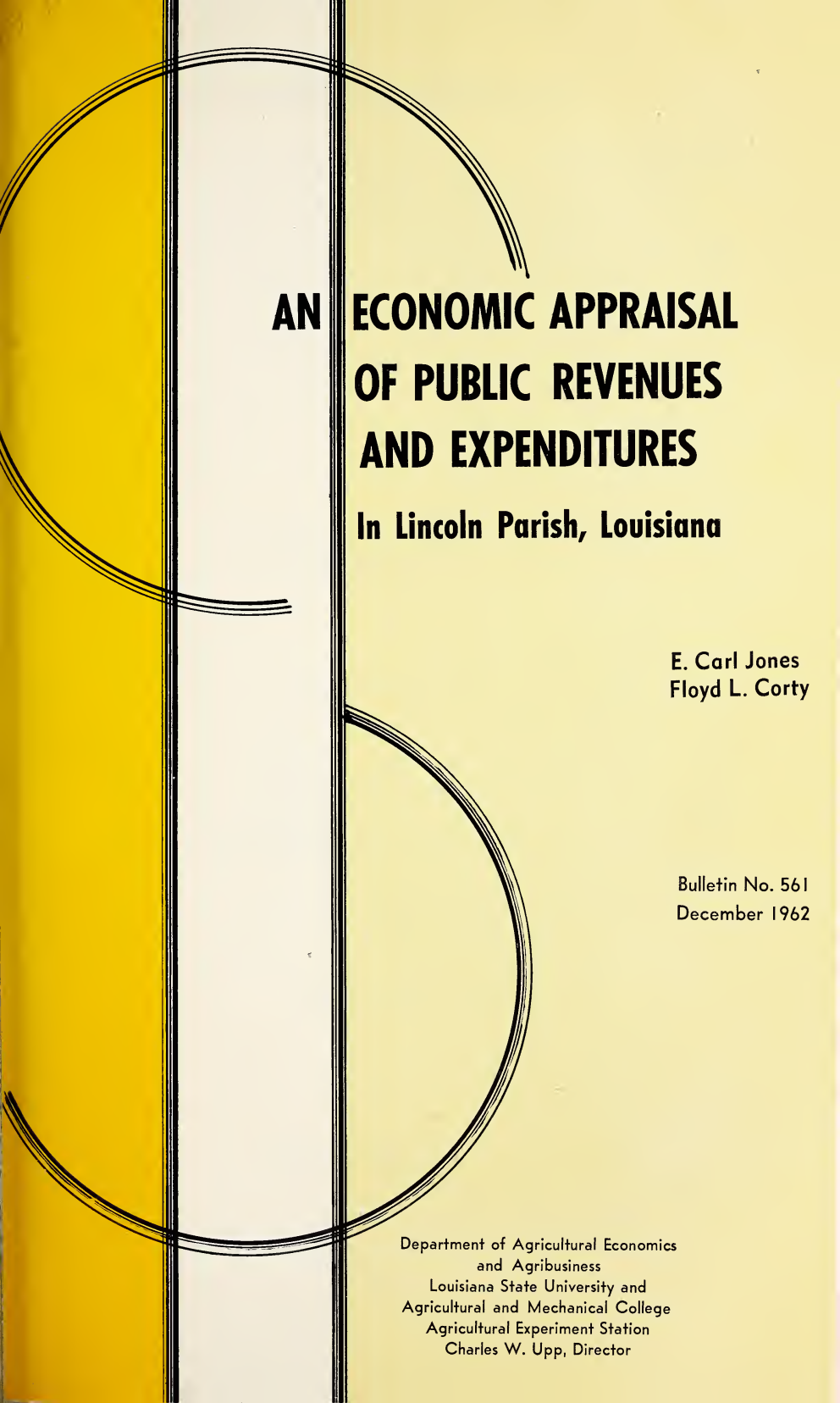
\*\*\*Assumes an 8 percent replacement program, 3 percent death loss, and 90 percent calf crop.

**APPENDIX TABLE 39.—Estimated Monthly Labor Requirements for the Operation of General Farm A, North Central Louisiana**

|           | Enterprise |       |       |       |
|-----------|------------|-------|-------|-------|
| Month     | Corn       | Hogs  | Beef  | Total |
|           | (Hours)    |       |       |       |
| January   | ...        | 30.0  | 18.3  | 48.3  |
| February  | 83.9       | 20.0  | 19.9  | 123.8 |
| March     | 60.3       | 20.0  | 17.6  | 97.9  |
| April     | 25.1       | 10.0  | 11.2  | 46.3  |
| May       | 70.4       | 10.0  | ..    | 30.4  |
| June      | 50.2       | 10.0  | 2.0   | 62.2  |
| July      | ...        | 10.0  | 40.8  | 50.8  |
| August    | ...        | 10.0  | 2.0   | 12.0  |
| September | 210.0      | 20.0  | ..    | 230.0 |
| October   | ...        | 30.0  | 48.0  | 78.0  |
| November  | ...        | 40.0  | 9.2   | 49.2  |
| December  | ...        | 40.0  | 18.3  | 58.3  |
| Total     | 499.9      | 250.0 | 187.3 | 937.2 |

**APPENDIX TABLE 40.—Estimated Monthly Labor Requirements for the Operation of  
General Farm B, North Central Louisiana**

| Month     | Enterprise |       |                 |       | Total   |
|-----------|------------|-------|-----------------|-------|---------|
|           | Cotton     | Corn  | Hogs<br>(Hours) | Beef  |         |
| January   | 5.6        | ...   | 30.0            | 22.9  | 58.5    |
| February  | 11.2       | 111.9 | 20.0            | 24.9  | 168.0   |
| March     | ...        | 80.4  | 20.0            | 22.0  | 122.4   |
| April     | 21.6       | 33.5  | 10.0            | 14.0  | 79.1    |
| May       | 116.1      | 93.8  | 10.0            | ...   | 219.9   |
| June      | 24.0       | 67.0  | 10.0            | 2.0   | 103.0   |
| July      | 16.0       | ..    | 10.0            | 51.0  | 77.0    |
| August    | ..         | ..    | 10.0            | 2.0   | 12.0    |
| September | 320.0      | 280.0 | 20.0            | ..    | 620.0   |
| October   | ..         | ..    | 30.0            | 60.0  | 90.0    |
| November  | ..         | ..    | 40.0            | 11.5  | 51.5    |
| December  | ..         | ..    | 40.0            | 22.9  | 62.9    |
| Total     | 514.5      | 666.6 | 250.0           | 233.2 | 1,664.3 |



# **AN ECONOMIC APPRAISAL OF PUBLIC REVENUES AND EXPENDITURES**

**In Lincoln Parish, Louisiana**

**E. Carl Jones  
Floyd L. Corty**

Bulletin No. 561  
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Department of Agricultural Economics  
and Agribusiness  
Louisiana State University and  
Agricultural and Mechanical College  
Agricultural Experiment Station  
Charles W. Upp, Director



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## Foreword

Although this report presents specific data concerning the fiscal activities of Lincoln Parish, the findings in terms of structure, functions, problems, and future outlook, are applicable to more than half of the parishes in Louisiana.

Lincoln Parish, located in the north central part of the state, is predominantly rural; row-crop farming is fading into the background; there is a trend toward greater forest development; and the population growth seems to be limited to the urbanized area around the parish seat. These economic characteristics generally describe other hill-farm parishes of North Louisiana, as well as most of the Florida parishes in the southeast, and the flatwoods sections in the southwest.

Furthermore, all rural parishes have similar governmental organizations in accordance with the state constitution; hence, the sources of revenues and their expenditures will follow much the same pattern as that discussed for Lincoln Parish.

## Acknowledgment

The authors are grateful to the many public officials who willingly provided the information and data needed to carry out this project. Among those giving special encouragement and assistance were Mr. Morelle Emmons, Lincoln Parish Superintendent of Schools; Mr. Eddie Evans, Lincoln Parish Manager and Engineer; Mr. Charles Hightower, Lincoln Parish Assessor; and Mr. J. B. Lancaster, State Supervisor of Public Funds.

Appreciation is also expressed to personnel in the School of Business Administration at Louisiana Polytechnic Institute for their helpful suggestions, especially Dr. Howard Balsley, Head, Department of Business and Economic Research, and Dr. Irol Balsley, Professor of Office Administration. Special thanks are due Dr. Leo Polopolus, Department of Agricultural Economics and Agribusiness at Louisiana State University, for reviewing the manuscript.

# **An Economic Appraisal Of Public Revenues and Expenditures In Lincoln Parish, Louisiana**

E. CARL JONES AND F. L. CORTY\*

## **Introduction**

Demands for public services increase and expand with each succeeding generation. The affluent society of today demands better schools, better roads, better protection of health and welfare, and greater opportunities for recreation and use of leisure time than any before it.

Obtaining funds necessary to provide the desired services is a disturbing problem facing public administrators. Historically, the general property tax served as a substantial source of revenue. Today, it plays a somewhat lesser role. Supplementary funds are derived from many other sources; for example, the income tax, severance tax, sales tax, gasoline tax, and numerous use taxes. But these supplementary taxes are collected and distributed by higher levels of government and bear the stamp of these more powerful agencies. As communities place less reliance upon property tax revenues and more upon revenues provided through state and federal aid, they lose an increasing share of their autonomy and submit themselves to greater control by state and federal governments.

The sources and needs for public funds in typical rural communities will vary from those for urbanized communities but in both instances there appears to be a trend for increased financial support from state and federal governments. In rural areas this trend is accelerated by technological changes that are displacing rural people. As land is taken out of agriculture and put into forest use it becomes a lower class use and the tax base is reduced. On the other hand, as land is taken out of agriculture and used for residential or industrial development the tax base increases.

In the hill-farm area of Louisiana there has been an apparent decline in agriculture. Rural populations are being lost to urban areas and the swelling urban populations are expressing an ever-increasing demand for public services.

Lincoln Parish, the unit of government being examined in this study, experienced a population increase of only about 3,000 in the

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decade 1950-60. Virtually all of this increase, however, accrued to Ruston, the parish seat. More impressive changes occurred in the rural areas. The percentage of land area in farms declined from a peak of 83 percent in 1940 to 39 percent in 1960. Likewise, the number of farms declined from about 3,000 to about 800 respectively, and harvested cropland reduced to one-twelfth the acreage reported 20 years ago. In light of these changes, one would expect a decreasing demand for rural services and an increasing demand for urban services. Appropriate adjustments in the sources of revenue would also be necessary.

## Objectives of the Study

This study examines the past and present sources of revenue of the Lincoln Parish governing bodies to determine the adequacy of existing revenues to meet future demands of the parish government. Pertinent questions which arise are: How much does it cost to operate a rural parish? What are the costs for the various functions performed? What are the sources of revenue? How self supporting is a rural parish? Is the parish gradually losing its autonomy and becoming a charge of the state? What has happened to the property tax base? What adjustments have occurred in the sources and expenditures of public funds?

More specifically the objectives are:

1. To identify all the sources of revenue and relate each to the public services they provide.
2. To determine the effect of changes in land use on property tax revenues in Lincoln Parish.
3. To determine the extent of local autonomy or degree of reliance upon state and federal aid in support of parish government functions.
4. To analyze items of revenue and expenditures as to trend over a period of years and make projections as to future needs.
5. To analyze the effect of change in age groups of the population upon revenue needs of Lincoln Parish.
6. To evaluate existing revenue-expenditure relationships and make recommendations that may promote sound fiscal policy for parish government in the future.

## Sources of Data

Sources of revenue available to parish governments were determined from a review of portions of the constitution of Louisiana dealing with local government organization and finance, the Louisiana Revised Statutes of 1950, the ordinances of the parish police jury, the ordinances of the parish school board, and the many amendments thereto, including opinions of the attorney general in some controversial areas.

Audited reports of the Lincoln Parish Police Jury, School Board, Clerk of Court, Tax Assessor, and Sheriff were made available by the state supervisor of public funds and the parish manager.

Financial statements of the police jury and school board, along with reports from the Louisiana Tax Commission and the collector of revenue



were obtained through these respective offices. Various members of the police jury and school board and other public officials were interviewed to determine the status of the several funds maintained by agencies of the parish government.

The tax assessor provided much information concerning assessment procedures and made assessment rolls available for examination. Additional assessment data on land classification and land values were derived from reports of the Louisiana Tax Commission.

Land and population statistics were obtained from reports published by the Bureau of the Census, United States Department of Commerce.

## Historical Development

The Louisiana constitution and statutory laws provide for the organization of governing bodies within a parish. Some of these bodies are specifically required by the constitution; others are the product of local organization.

The United States Department of Commerce, Bureau of the Census, in its census of governments for 1957, lists a total of seven distinct governmental units in Lincoln Parish: the central parish government called the police jury, the parish school board, and five municipalities.<sup>1</sup> For revenue purposes there are eight other units not included in the Bureau of the Census listing: seven school districts and one recreational district. These are adjuncts of the school district and parish government and are therefore administered by the school board and police jury, respectively.

### Creation of Parish Offices and Police Jury

The first legislative council at its meeting on December 4, 1804, divided the Orleans Territory into 12 geographical districts and called them "counties," as in the other states. The act also created the offices of county judge, justices of peace, sheriff, coroner, clerk, and treasurer for each county. However, as confusion arose over the term "county" because of the acquaintance of the inhabitants with the church parish as a geographical area of administration of civil law, the legislature and the governor, by legal act approved March 31, 1807, redivided the territory geographically into 19 areas which were redesignated "parishes."<sup>2</sup> The boundaries of these were based mostly on those of the original 21 ecclesiastical parishes established by the Spanish in 1769. This act, while creating the parish as the basic local government area for court purposes, did not abolish the county. Section 32 reads: "That the division of the territory into counties shall subsist for the purpose of making the election of the representatives of the territory, and levying

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<sup>1</sup>U. S. Bureau of the Census, *1957 Census of Governments*, I (1959), p. 20.

<sup>2</sup>Calhoun, Robert Dabney, *The Origin and Early Development of County-Parish Government in Louisiana (1805-1845)*, (Reprinted from "The Louisiana Historical Quarterly", 1934).

the territorial taxes.”<sup>3</sup> All county offices established by the 1804 act were abolished. The parishes were divided into five superior court districts, with a sheriff and a clerk appointed to each.

During the approximately two-year existence of the 12 counties, they had been governed by county judges as chief administrative officers with taxing powers, assisted by the justices of peace and the other officers mentioned in the 1804 act, all appointed by the governor.

The 19 parishes were at first governed in a similar manner, except that a parish judge assumed the duties of the county judge and all other officers, until April 6, 1807, at which time the parish judge was authorized to appoint “a jury of twelve inhabitants” to serve with him and the justices of peace. This group, which later came to be called the “police assembly,” was charged with the responsibility for “execution of whatever concerns the interior and local police and administration of their parish,” included the raising of funds. On March 16, 1810, an act was passed creating the office of sheriff for each parish alongside the five district court sheriffs and providing for his compensation from the “police assembly of the parish.” This was the first designation of the body composed of the parish judge and the 12 citizens as a “police assembly.”

A legislative act of April 30, 1811, made members of the police assembly elective and designated the body officially for the first time as a “police jury,” although the term was first used in an act of March 6 of that year, creating the town of Vidalia. Powers of the judge were reduced; he remained as ex-officio member of the jury. A state constitution was framed incorporating this system of government for local parishes and Louisiana became a state in 1812. Legislation of 1824 eliminated justices of the peace from the jury and in 1830 judges were excluded from membership. County designations continued to appear in official documents, in some cases representing two or more parishes, until all reference to counties was dropped in the Constitution of 1845.

On March 25, 1813, two years after the adoption of the term “police jury,” the legislature adopted legislation setting forth organization and powers of the jury and providing for the creation of subordinate geographical areas within parishes to be called “wards” for securing equal representation on the jury from all parts of the parish. It provided for the election of citizens from these wards to serve on the police juries without compensation and under penalty of fine for nonattendance at meetings. In subsequent years, as new parishes were created, police juries were given added powers by the legislature and compensation was provided for the members, but the penalty for nonattendance was retained in present law. These and later statutes relating to the establishment of parishes and wards within a parish were consolidated in 1950 into the Louisiana Revised Statutes of 1950, Title 33.

Accordingly, the police jury of a parish is permitted to redistrict the parish into not less than five nor more than twelve “police jury

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<sup>3</sup>*Ibid.*, p. 34.

wards" by a two-thirds record vote of the jury, which decides the ward boundaries at will. Thereafter, one police juror is elected by the voters from each ward of the parish at a general state election for a term of four years.<sup>4</sup>

In addition, when a parish has a population between 50,000 and 175,000, and a ward has more than 7,500 inhabitants, it may elect another juror for each 10,000 inhabitants or part thereof in excess of 7,500.<sup>5</sup> No additional juror is authorized for population in excess of 175,000 in the parish. In parishes having a population of less than 50,000, an additional police juror is elected for each additional 5,000 persons in a ward or part thereof in excess of 2,500. For example, assume that a parish has a population of 45,000 at the latest census count, 17,500 of whom live in Ward 1 of the parish. Ward 1 is entitled to one police juror as a ward, one additional juror for the first 5,000 in excess of 2,500 persons, another for the next 5,000, and one other for the next and last 5,000 persons, for a total of four jurors on the police jury for the parish, all of whom must be residents of Ward 1.

## Creation of the Parish School Board

Police juries were authorized in 1821 to levy a tax for educational purposes. The tax could not be more than one thousand dollars in each parish. The police jury had to account to school trustees for all funds collected by the tax. Other funds received from the state by the trustees were subject to review by a grand jury.

In 1827 the legislature authorized police juries to appoint a five-member board of administrators for the general administration of the schools in each parish.<sup>6</sup> The board of a parish, after choosing its own officers, annually appointed three heads of families in each ward as trustees of schools in that ward. The board was responsible for apportioning state funds among the various wards. Each school could have not more than 100 free students each session; others were required to pay tuition for the financial support of the school.

The Louisiana Constitution of 1845 provided for a system of public schools throughout the state and in 1847 the position of parish superintendent was created by the legislature. He was to be elected for a two-year term and was to act as parish treasurer for school funds. General supervisory power over the parish school system was placed in his hands.

Working in cooperation with the police jury, the superintendent was authorized to lay out school districts, and three school directors were to be elected each year for each district. These directors assumed the powers of the former ward school trustees.

For additional finances to support the school system, the state levied

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<sup>4</sup>Title 33, Section 1233, Revised Statutes of 1950.

<sup>5</sup>Title 33, Section 1233, Revised Statutes of 1950.

<sup>6</sup>Carleton, R. L., *Local Government and Administration in Louisiana*, Baton Rouge, Louisiana State University Press, 1935, p. 59.

a general property tax of one mill per dollar of assessed valuation of all taxable property. Proceeds from this tax were prorated among the parishes.

The duties of the parish superintendent were delegated to the parish treasurer in 1856 and the police jury of a parish was given the authority to set the qualifications of teachers. The board of directors of each school district was given corporate powers. When additional money was needed for the support of the school system in addition to that received from the state and parish, such amount could be raised by a property tax levied within the district. However, no tax could be levied for the building of a schoolhouse in any district without the consent of a majority of the qualified voters of the district.<sup>7</sup>

In 1870 the state was divided geographically into six educational divisions. Upon nomination by the state superintendent of education, a superintendent of each of these divisions was appointed by the governor. A board of directors consisting of three to five members for each of the divisions was appointed by the State Board of Education. The office of parish superintendent was subsequently abolished, and a board of parish directors, consisting of five or more members, was appointed for each parish by the State Board of Education. This created a situation in which there were both division and parish boards of directors for the school system. Members of these boards held office for two years.

To finance the school system, police juries were authorized to levy an annual tax of not more than two mills per dollar of assessed value of property to be apportioned among the school districts of the parishes according to the number of educable school children in each district. Each school district within a parish was governed by a board of three appointed directors. Voters of a school district could vote a school tax, not to exceed 10 mills per dollar on all taxable property in the district.

Following the Civil War, the acts of 1870 brought such sweeping changes in the public education system of Louisiana that "the whole school system of the state assumed the form of a gigantic pyramid with the governor at the apex."<sup>8</sup> A State Board of Education was established to prepare general rules and regulations for the schools in the state and to provide necessary supervision. Parish boards were called upon to enforce these regulations and to provide for a major portion of school financing. The structure of the present educational system in Louisiana is the result of this pattern of development.

The Constitution of 1921 authorizes the legislature to confer upon a State Board of Education, consisting of 11 members elected by the voters of eight congressional districts and three public service commission districts, authority to supervise and control all free public schools of the state except Louisiana State University. This board has as its secretary and executive officer the state superintendent of education, who is elected each four years at the general state election.

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<sup>7</sup>*Louisiana Revised Statutes of 1856*, pp. 190-195.

<sup>8</sup>Carleton, R. L., *op. cit.*, p. 59.



School funds appropriated by the state legislature are distributed to the parishes through the state superintendent and State Board of Education. Parish school boards receive funds from the state board to carry out the school functions in each parish, subject to the general supervision of the state superintendent of education.

## **Lincoln Parish Governing Agencies and Their Functions**

Lincoln Parish was created by Act 32 of the Legislature of 1873 from portions of the parishes of Bienville, Claiborne, Jackson, and Union. Four years later, a part of the new parish was annexed to Jackson Parish on the south by Act 29 of 1877. In 1904 a portion of Jackson Parish was returned to Lincoln Parish by Act 97, extending its boundaries to the present limits. The parish was then divided into eight wards. There is no central government for a ward analagous to that of a police jury for the parish.

### **The Parish Police Jury**

The central parish governing body consists of 11 police jurors, elected by wards. The 1962 population of the wards is such that seven of them are represented by one juror each, while Ward 1, containing the parish seat of Ruston, has four members on the jury. The body is responsible for road construction and maintenance, health and sanitation ordinances, construction and operation of a courthouse, establishment of polling places for elections, and other civil duties delegated to a jury by the state legislature.

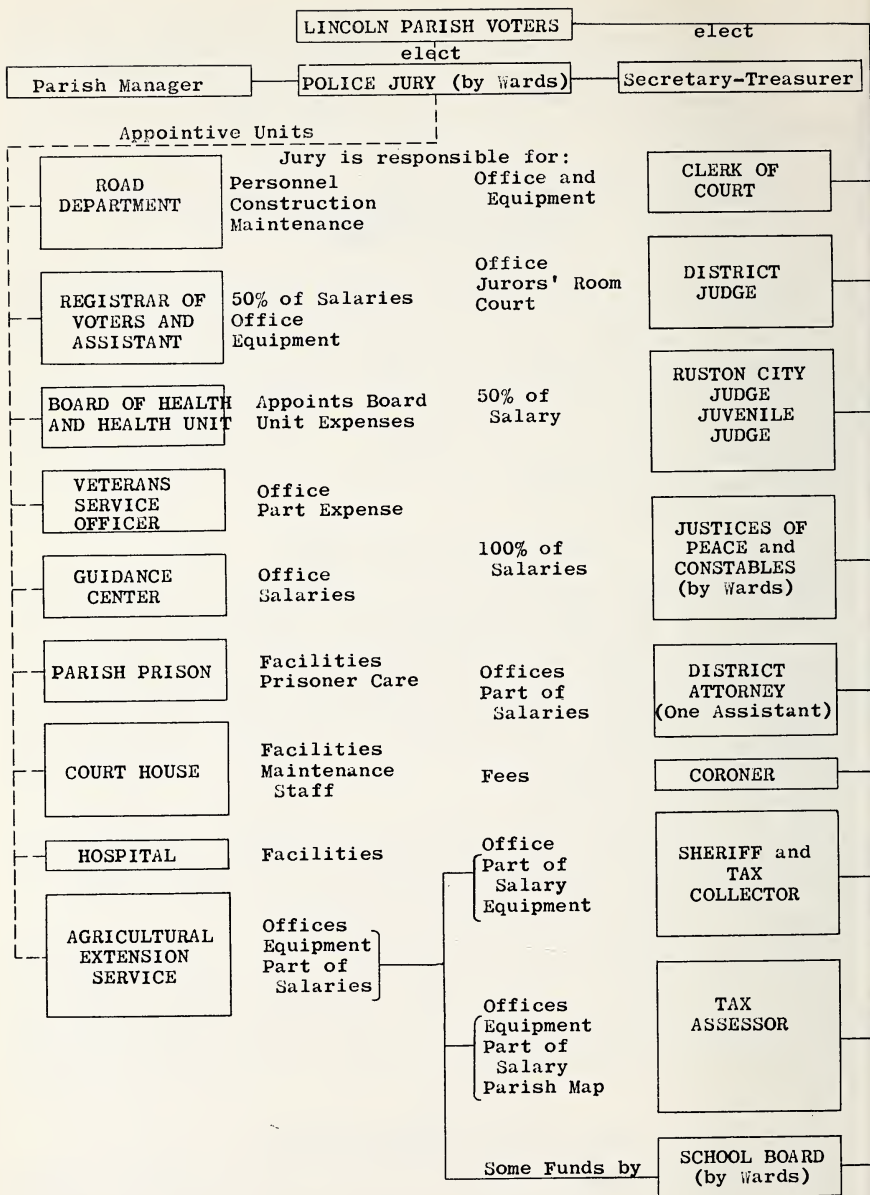
The jury elects a permanent secretary whose office can also be combined with that of the parish treasurer, who must be elected by the jury every two years. The Lincoln Parish body has combined these two offices, paying one person to serve in both capacities.

Regular meetings of the police jury are held by legislative decree on the second Tuesday of each month. This central parish governing body has the authority to incur bonded indebtedness and to levy taxes and to require business licenses, special assessments, and fees, with some limitations by the state, for financial support of the services rendered to its citizens.

### **The Parish School Board**

In accordance with provisions of Title 17 of Revised Statutes of 1950, a parish school board can be composed of from five to sixteen members, one for each member of the police jury. Each is elected for a term of six years at congressional elections. One-third of the board must be elected every two years. If a parish has a municipality with a population exceeding one-half of the population of the parish, this municipality has representation on the board proportionate to its population. The Lincoln Parish School Board consists of 11 members from the eight





**Organizational Chart for Lincoln Parish Governing Agencies**

wards, according to these provisions, since the parish has 11 police jurors. It is an independent unit of government, entirely separate from the police jury, but cooperating with it on many matters of policy and law pertaining to the interests of the citizens of the parish. The board members meet once each month in regular session, and occasionally by special call of the president after due notice as required by law. They elect from among themselves a president and a vice-president for a term of not more than six years. Section 56 of Title 17 provides that each board member receive compensation of \$30 per day for attendance at the monthly meeting, plus 10 cents per mile travel pay from his home to the meeting place and return. When a member acts in an official capacity as a committee member for the board, he may receive \$30 per diem for one extra day per month unless his committee work falls on the same day as the board meeting.

The parish superintendent of schools is chosen and paid by the board; he also acts as ex-officio secretary of the board and keeps it informed as to needs and progress of the school system of the parish, as well as instructions and regulations from the state superintendent of education. The board also hires two parish supervisors of schools—one white and one Negro—to assist the superintendent, a visiting teacher for the parish, and the corps of teachers, administrators, bus drivers, and maintenance personnel of the various schools in the parish.

Like the police jury, but acting as an independent unit of government, the school board is authorized to levy taxes and incur bonded indebtedness (subject to limitations imposed by the state) for the purpose of conducting the school system within the parish. Louisiana statutes also permit the school board to establish various kinds of subordinate areas or bodies for local school finance and administration, such as junior college districts, local school districts, consolidated school districts, and a parish-wide school district. Each of these areas is an adjunct of the school board and has no other separate governing unit; however, the board's tax and debt authority limitations on a parish-wide basis can be duplicated for any one of the special districts created. For example, suppose the board levies a tax at the legal maximum rate of five mills parish-wide for general school maintenance. It can create a school district in a portion of the parish and levy the same millage again within that district, for a total of 10 mills therein. While these are two legally separate areas for revenue purposes, both are administered by the same board, and the same property owners pay both taxes, to the extent that their property lies in both districts.

### **Municipalities**

The third element of local government in Louisiana, in addition to the police jury and school board, is the municipal government, commonly referred to as city or town government. There are five municipal governments in Lincoln Parish; namely, Ruston, Dubach, Choudrant, Simsboro, and Grambling. Each is administered by a town or city coun-

cil, the members of which are elected for four-year terms by the voters living within the respective municipality. Each of these governing bodies is authorized by the state legislature, with constitutional authority, to provide for the raising of revenue in support of its functions. Revenue sources permitted are general property taxes, special assessments, business licenses, fees and fines, and public utilities.

Property taxes for general fund purposes of municipalities are limited to seven mills per dollar of assessed value of property within the boundaries of the town or city by Article 14, Section 12, of the Constitution of 1921, compared with the maximum rate of four mills for parish governments fixed by Section 11. Exceptions to this rate are found in the city of New Orleans, and cities of 75,000 or more, which can levy a special tax of one mill for the support of a three-platoon police department.

Residents of municipalities are also governed by the ordinances and regulations of parish government, except in a few instances where municipal residents are exempt from their application by state law and in cases where the parish government voluntarily exempts them from being subject to its actions because the town or city has ordinances similar to those of the parish. In Lincoln Parish, municipal property owners in the city of Ruston are exempt by state law from one-half of the four mills parish general property tax since the city builds and maintains its own streets and roads.

## **Other Agencies or Offices**

In addition to these major governmental units, there are offices and agencies which are partially controlled by the parish government and some which independently carry out governmental functions but do not have legislative and taxing power as do the police jury and school board. Following is a list and a brief description of each. (Also see organizational chart, page 12).

### **Clerk of District Court**

Article 7, Section 66, of the Constitution of 1921 provides for one clerk of district court in each parish, to be elected by the parish voters each four years at the time of the gubernatorial election. Legislation effecting this provision and specifying powers and compensation is given in Revised Statutes of 1950, Title 13. The clerk's salary is fixed by the state legislature but is paid from a fund provided by fees charged for services rendered by his office; these fees are fixed by Revised Statutes 13.781 et. seq.

Article 7, Section 67, of the constitution stipulates that clerks may appoint deputies with the approval of district judges. The salaries of these, as well as expenses of the office except for equipment, are paid from the fund accumulated through service fees. The parish police jury furnishes office quarters in the courthouse and provides office equipment, such as legal forms, bindings for legal documents, and storage

cabinets for public records. Any surplus in the salary fund at the close of a term of district court in excess of one-third of the past year's revenue is remitted to the police jury, as required by Revised Statutes 13:785. The clerk may convene the police jury into session whenever the office of president of the jury is vacant. This is the relationship which the parish governing body holds to the office of clerk of district court.

### **Judges, Courts and District Attorneys**

Article 7, Sections 31-35, of the Constitution of 1921 authorizes the legislature to divide the state into judicial districts and arrange for election and compensation of judges for same. The parishes of Lincoln and Union comprise the Third Judicial District with one judge who is elected by the qualified voters of the district each six years. His basic salary of \$5,000 per year, payable monthly on his own warrant, is paid by the state from its general fund. However, the parish police jury is required by law to provide a suitable courthouse with sufficient rooms for jurors, witnesses, and for the district judge to preside over court cases during his circuit in the parish. It must also pay for attendance of grand jurors, petit jurors, witnesses, and clerk of court costs. The provision and maintenance of a jail to house prisoners, as well as the care of them, are further obligations of the parish government.

Section 51 of Article 7 permits the legislature to abolish justice of peace courts (described below) in wards embracing a parish seat, or containing cities of more than 5,000 inhabitants, and to create in their place a new city court to have civil jurisdiction over certain types of cases. This was done for Ward 1, containing the city of Ruston. Compensation for the judge of the city court in this instance is fixed by the legislature but is paid one-half by the city of Ruston and one-half by Lincoln Parish in accord with provisions of the law establishing the court. The parish's share of this expense is \$6,000 per year. The judge is elected each six years. This court also serves as juvenile court for the ward in accordance with the provision of Section 52 of Article 7. Extra compensation of \$1,200 per year for the judge is provided by the state for this function.

One district attorney for each judicial district in the state is afforded by Article 7, Section 58, of the constitution, and by the Revised Statutes of 1950, Title 16. He is elected for a term of six years at the same time as the district judge. His salary is fixed by the state legislature, as well as the proportion of it which is to be paid by each parish in the district. In addition, he receives \$5,000 per year from the state. An expense allowance of \$5,000 per year for clerks and assistants, supplies and travel expense is granted to the district attorney by the state; any expense in excess of this amount must be borne by the parish police juries.

### **Justices of Peace and Constables**

Sections 46-48 of Article 7 of the constitution provide for the division of a parish into justice of the peace wards by the police jury and



for the election of one justice of peace in each ward at the general state election every four years. Section 49 permits the election of one constable for each justice of peace court at the same time. Section 50 requires that justices of peace and constables shall receive fees as fixed by the legislature for their services in civil cases, but in lieu of fees in criminal and peace-bond cases they shall be paid a salary to be fixed and paid by the police jury in proportion to the amount of work or business done. There are seven justices of peace and seven constables in Lincoln Parish. Much of the work of a justice of peace centers around the performance of marriages and the exercise of notary public functions. A constable serves as a ward policeman.

### **Coroner**

Article 7, Section 70, and Revised Statutes of 1950, Title 33, provide for the election of a coroner for a parish by the electors at the general state election for a term of four years. He must be a doctor of medicine and be licensed to practice in the state. He is essentially the parish physician. He must investigate and certify the death of a person when a physician was not in attendance prior to or at time of death. The constitution requires that he shall act for and in place of the sheriff whenever the latter is an interested party to a legal dispute and when his office is vacated, except that a coroner cannot act as tax collector. The police jury provides compensation for his office as coroner, and fees as fixed by the legislature are charged for his services.

### **Sheriff**

The office of sheriff in each parish in Louisiana is created by authority granted in Article 7, Section 65, of the Constitution of 1921. Sections 73 and 74 provide for compensation for same. This authority is made effective by Revised Statutes of 1950, Title 33, Sections 1421-1423. The sheriff is the chief law enforcement officer for the parish, enforcing the parish ordinances and the laws of the state within the parish. In addition, the constitution provides that "... the sheriff, except in the Parish of Orleans, shall be ex-officio collector of state, parish, and all other taxes, except municipal taxes, which, however, under legislative authority he may also collect." He is elected each four years by the parish voters. He may appoint deputies to assist in law enforcement, as well as a deputy tax collector.

Act 447 of 1958 fixed the Lincoln Parish sheriff's salary at \$9,000 per year. The legislative session of 1960 raised the salary to \$10,200. To provide a fund for his compensation and other expenses of the sheriff's office, the sheriff is permitted to collect fees in civil, criminal, and other matters of law and to deduct a commission from all taxes he collects. A minimum of \$1,000 must be maintained in the salary fund from these sources. Revised Statutes of 1950, Title 33, as amended by Act 446 of 1958, sets the commission from tax collections for the Lincoln Parish sheriff at "ten per cent of the first \$450,000 and six per cent of all amounts over \$450,000 of aggregate taxes shown to be col-



lectible by the tax rolls: all state, parish, school, levee, and other taxes and licenses, including all special taxes, except the Confederate veterans tax, including hunting and fishing licenses collected by him and actually paid by him into the state and parish treasury or to the authority designated by law to receive the same."

The parish police jury provides office quarters in the courthouse for the sheriff and maintains a jail and prison facilities. The jury may provide equipment for the sheriff, but this is usually provided from the salary and expense fund. This is the only relationship that the parish government holds to the office of the parish sheriff.

### **Tax Assessor**

Title 47, Section 1901, of the Revised Statutes of 1950, originally passed by the legislature of 1906, provides for the election of a tax assessor in each parish except Orleans at the general state election to be held every four years. Constitutional authority for this is Article 14, Section 9. His term of office dates from and after the 31st day of December of the year in which he is elected.

The duty of the tax assessor is to enumerate, list, and assess property for tax purposes as directed by property taxation laws of the state. After preparing the tax rolls each year, showing valuations and assessments made, he must present them to the Louisiana Tax Commission and to the police jury within the time and manner prescribed by the laws regulating the assessment and review of assessment of property. He has no authority to collect the taxes. The assessor may hire as many deputies as he may require. Two are employed by the Lincoln Parish assessor (1960). He may use these deputies in the actual work of assessing the property or preparing the tax rolls, but the assessor remains responsible officially for any acts performed by them.

The salary of the assessor and an allowance for office expense are fixed by the state legislature. Act 99 of 1960 placed the salary of the Lincoln assessor at \$9,600 per year. In order to provide a fund from which his salary and expenses of his office are paid, the parish governing authority and the parish school board advance to him a sum in the beginning of each year sufficient to cover these expenses. Whenever the assessor has completed his assessment roll and filed it with the Louisiana Tax Commission, and upon the final acceptance of the assessment roll, the treasurer of the state of Louisiana, the treasurer of the city of Ruston, and the Louisiana Forestry Commission, all receiving property taxes from Lincoln Parish, pay to the assessor for the salary and expense fund an amount proportionate to the share of taxes received by each. The assessor refunds the portion of the police jury and school board advancement that is in excess of their shares of assessment cost. Thus, in the final analysis, the burden of the salary and expenses of the tax assessor does not fall entirely on the parish government. It is required to furnish office space and equipment for the tax assessor, such as binders for the permanent tax records and office

machines. However, in practice most equipment is purchased from the assessor's expense fund. The police jury also serves as reviewing body in case of complaints arising from property owners regarding the assessment and valuation placed on their property by the assessor. The police jury and school board are required to furnish a map of the parish on which all taxable property can be identified.

Act 170 of the legislature of 1898 provides that the governor may remove the assessor from office at any time for negligence, inefficiency, incompetency, malfeasance, or any cause which he may consider sufficiently grave.

### **Registrar of Voters**

The office of registrar of voters is authorized by Article 8, Section 18, of the Constitution of 1921 and was created by legislation incorporated as Title 18 of the Revised Statutes of 1950. The registrar is an officer of the parish who is appointed by the police jury, subject to approval by the governor of the state. The governor may remove the registrar for reasons of negligence in the administration of his duties.

The salary of a registrar of voters is fixed by the legislature in Section 5 of Title 18 according to the population of the parish at the latest United States decennial census or as determined otherwise by the police jury. Act 246 of 1960, Section 1, amended the salary schedule to make it \$5,950 per year for a registrar of voters when the population of a parish is 20,001 to 30,000. This is the salary of the Lincoln Parish registrar since the parish had a population count of 25,782 in 1950. One-half of the salary is paid by the police jury and one-half from the state general fund. Act 558 of 1960 permits the police jury to pay the registrar a supplementary amount up to \$2,500 per year. In addition to paying one-half of the salary, the police jury must furnish facilities for the registrar.

Section 6 of Title 18 provides for one deputy registrar for Lincoln Parish at a salary of \$2,400 per year, one-half of which is paid by the parish and one-half by the state (Act 77 of 1959). The deputy is appointed by the registrar.

A registrar may employ additional clerical help in emergencies upon approval by the police jury, which must pay for it, or the governor may appoint extra help out of his funds for law enforcement.

The duty of the registrar is to conduct the registration of citizens for voting and prepare a qualified list of voters for each local, state, and national election in accord with voter registration laws of the state. His office is closed to prospective registrants 30 days before each election, during which time the qualified list of voters is prepared.

### **Board of Health and Health Unit**

Article 6, Section 11, of the constitution requires the legislature to create a board of health for each parish to be subordinate to the State Board of Health. This board now exists for Lincoln Parish and serves without compensation. In cooperation with the State Board of Health,

the parish provides an annual sum for the maintenance, operation and staffing of a parish health center facility. This agency offers medical aid to the general public of the parish in certain circumstances such as epidemics, publicly promoted inoculations, birth registrations, and the like. A doctor, known as the parish health officer, is hired as head officer of the unit. He is assisted by nurses and aides.

### **Veterans' Service Officer**

The legislature, through the Department of Veterans Affairs, has made provision for the maintenance of a contact officer for veterans of United States military service at the parish seat of government. To maintain the office with one employee as service officer, the Lincoln Parish Police Jury furnishes quarters in the courthouse and some financial aid.

### **Guidance Center**

The police jury of Lincoln Parish has established an office in the courthouse known as a guidance center where citizens may consult with a physician dealing with problems of mental health.

### **Agricultural Extension Service Offices**

As in all other parishes in Louisiana, Lincoln Parish enjoys the services of an agricultural agent and a home demonstration agent, with their assistants. The Agricultural Extension Service of Louisiana State University, in cooperation with the United States Department of Agriculture, employs and supervises these agents. The act of Congress which established these services sought to encourage local support for the program. Accordingly, the parish police jury and the parish school board over the years have contributed funds to pay a portion of the salary of each agent. No fixed sum is required by law. In the past there have been years when one or the other has seen fit to reduce its contribution because of financial shortages. In recent years, however, the annual amount allocated to the Extension Service has remained the same. These funds are paid directly to the agents as a part of their total annual salary. Each year the police jury and school board report to the extension service the amounts paid to the agents. In addition, the police jury provides telephone service and office space in the courthouse. The jury and school board must approve the appointment of agricultural agents and subsequently requires from them periodic reports of their work.

### **Department of Public Welfare**

The Louisiana Department of Public Welfare maintains an office in Lincoln Parish for the administration of federal-state welfare funds within the parish. The police jury supplies office quarters in the courthouse for this office. Beginning in 1960, the Department of Public Welfare contributes \$200 per month to the upkeep of the courthouse, in lieu of rent. There is at present no other financial or administrative relationship of the parish government to the public welfare office.

# Sources of Revenue and Expenditures at the Various Levels of Parish Government

A summary of all sources of revenue legally available to the parish governing bodies and the extent to which these were utilized in 1959 are discussed in this section. Since the fiscal system of Lincoln Parish is concerned with five separate governmental agencies, the revenue-expenditure activity of each one is considered separately. First among these agencies is the police jury.

## Police Jury Revenue

Income for all functions of the Lincoln Parish Police Jury, in 1959, was in excess of a half-million dollars. This is summarized in Table 1. Ad valorem property taxes accounted for \$276,511, or 48 percent of all police jury revenues. Other important sources of revenue, in order of magnitude, were: (1) the gasoline tax; (2) the severance tax; and (3) state grants-in-aid for highways.

An insight into the revenue-expenditure structure of the Lincoln Parish Police Jury is acquired from a detailed examination of the data relevant to these matters. Consider first the sources of revenue employed by the parish government as indicated in Table 2 and explained in greater detail in subsequent paragraphs.

**TABLE 1.—Summary of Lincoln Parish Police Jury Revenues, 1959**

|                                                      |              |
|------------------------------------------------------|--------------|
| Property taxes:                                      |              |
| General alimony 2 and 4 mills tax .....              | \$ 50,470.74 |
| Road maintenance 5 mills tax .....                   | 81,010.60    |
| Road construction 5 mills tax .....                  | 81,016.46    |
| Ward 6 Recreation District 1 mill tax .....          | 1,209.65     |
| Total ad valorem, except for bonds .....             | \$213,707.45 |
| Revenue from bond taxes <sup>a</sup> .....           | 62,804.29    |
| Total all ad valorem taxes .....                     | \$276,511.74 |
| Gasoline tax .....                                   | \$106,444.51 |
| Severance tax .....                                  | 94,840.96    |
| Business licenses .....                              | 1,175.00     |
| Fees, fines and forfeitures .....                    | 14,251.89    |
| Department of Highways grants .....                  | 40,000.00    |
| Appropriations of legislature .....                  | 30,000.00    |
| Miscellaneous receipts .....                         | 12,187.17    |
| Total revenue, all sources .....                     | \$575,411.27 |
| Ad valorem taxes as per cent of total revenues ..... | 48%          |
| <sup>a</sup> Bond tax revenue:                       |              |
| Courthouse 2 mills tax .....                         | \$ 37,316.87 |
| Hospital 4 mills tax .....                           | 25,487.42    |
| Total bond tax revenue .....                         | \$ 62,804.29 |



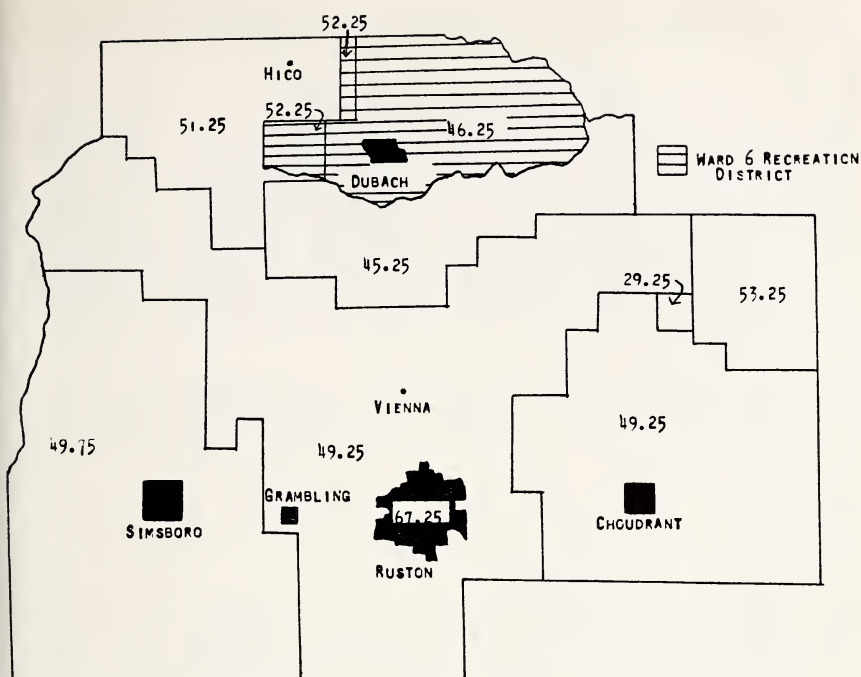


**FIGURE 1.—Map of Lincoln Parish, La., showing property tax rates in 1959 and 1960 by tax districts. Tax rate is in mills per dollar of assessed value of property and includes the state tax rate of 5.75 mills throughout the parish.**

### Ad Valorem Property Taxes

**General Alimony Tax.**—The “general alimony” tax is an ad valorem tax levied against personal and real property for general governmental purposes.<sup>9</sup> The procedure for levying the ad valorem tax is spelled out by the legislature. The tax assessor of the parish and the Louisiana Tax Commission list all nonexempt personal and real property in the parish, then place an assessed value on each property. A tax rate, known as number of mills per dollar of assessed value, is determined by the police jury according to the amount of revenue required. But the millage rate must still conform with legal limitations.

The sheriff collects the tax when it becomes due at the close of a calendar year. Section 1 of Article 10 of the constitution states:

The valuation and classification (of property) fixed for State purposes shall be the valuation and classification for local purposes; but the taxing authorities of the local subdivision may adopt a different percentage of such valuation for purposes of local taxation.

<sup>9</sup>Louisiana Constitution of 1921, Article 10, Sections 1 and 5, and Article 14, Section 11; Revised Statutes of 1950, Title 47.



TABLE 2.—Sources of Revenue Utilized by Lincoln Parish Governmental Agencies Showing Legal Limitations, Current Amount Levied, Amount Collected in a Year, and Function for which the Revenue Was Spent

| Revenue Source                                                 | Legal Limitation                                                                                                           | Current Rate, 1959                                         | 1959 Income <sup>c</sup> | Distribution                                                                                              |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------|
| I. Property Taxes:                                             |                                                                                                                            |                                                            |                          |                                                                                                           |
| A. Police jury                                                 |                                                                                                                            |                                                            |                          |                                                                                                           |
| 1. General alimony tax                                         | 4 mills; no vote required                                                                                                  | 2 mills in Ruston;<br>4 mills outside<br>Ruston<br>5 mills | \$ 50,471                | General government                                                                                        |
| 2. Road construction tax                                       | 5 mills, maximum 10 years, vote required, renewable                                                                        | 5 mills                                                    | 81,016                   | Construction and improvement of roads                                                                     |
| 3. Road maintenance tax                                        | 5 mills, maximum 10 years, vote required, renewable                                                                        | 5 mills                                                    | 81,011                   | Maintenance of roads and bridges                                                                          |
| 4. Recreation district tax                                     | 5 mills, maximum 10 years, vote required, renewable                                                                        | 1 mill                                                     | 1,210                    | Maintenance and operation of recreation center in Ward 6                                                  |
| 5. Acreage tax, timber lands                                   | 2 cents per acre, no vote required                                                                                         | 2 cents per acre                                           | (2,818 <sup>a</sup> )    | Louisiana Forestry Commission for forest protection from fire                                             |
| 6. Acreage tax, timber lands                                   | 50 cents per acre, vote required                                                                                           | None                                                       | None                     | Fund into bonds for additional aid to public schools or public improvements                               |
| 7. Courthouse bonds tax                                        | Vote required (d)                                                                                                          | 2 mills                                                    | 37,317                   | Interest and redemption of bonds                                                                          |
| 8. Hospital bonds tax                                          | Vote required (d)                                                                                                          | 4 mills                                                    | 25,487 <sup>b</sup>      | Interest and redemption of bonds                                                                          |
| B. School board                                                |                                                                                                                            |                                                            |                          |                                                                                                           |
| 1. Parish-wide constitutional tax                              | 5 mills, no vote required                                                                                                  | 5 mills                                                    | 96,234                   | Current operating expenses of schools                                                                     |
| 2. Parish-wide construction tax (additional support)           | 7 mills, maximum 10 years, vote required, renewable                                                                        | 5 mills                                                    | 96,234                   | Repair and maintenance of school plant                                                                    |
| 3. Parish-wide maintenance tax (special repairs and equipment) | 5 mills, maximum 10 years, vote required, renewable                                                                        | 2 mills                                                    | 39,011                   | Maintenance or operating expense of school buildings                                                      |
| 4. Parish-wide bond tax                                        | Vote required (d)                                                                                                          | 7.5 mills                                                  | 144,358                  | School construction                                                                                       |
| 5. District 1, Ruston, bond tax                                | Election required (d)                                                                                                      | 4 mills                                                    | 50,569                   | School construction                                                                                       |
| 6. District 3, Simsboro, bond tax                              | Election required (d)                                                                                                      | 4.5 mills                                                  | 6,422                    | School construction                                                                                       |
| 7. District 6, Choudrant, bond tax                             | Election required (d)                                                                                                      | 4 mills                                                    | 4,076                    | School construction                                                                                       |
| 8. District 7, Hico, bond tax                                  | Election required (d)                                                                                                      | 6 mills                                                    | 4,934                    | School construction                                                                                       |
| 9. District 24, Hopewell-Downsville, bond tax                  | Election required (d)                                                                                                      | 8 mills                                                    | 1,246                    | School construction                                                                                       |
| II. Other Taxes:                                               |                                                                                                                            |                                                            |                          |                                                                                                           |
| A. Gasoline (motor fuel) tax                                   | Percent of 1 cent of state tax which equals amount of fuel sold in parish ÷ amount sold in state in previous calendar year | Same                                                       | 106,445                  | Maintenance and improvement of roads and bridges, including maintenance of parish prisoners for road work |
| B. Severance tax                                               | 75% of state timber severance tax, plus 20% of other state severance taxes collected in parish up to \$200,000             | Same                                                       | 221,142 <sup>c</sup>     | General governmental and current operating expense of schools                                             |

| One-half road construction             |                                                                                                          |                                          |  |             |
|----------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------|--|-------------|
| 4. Grant of legislature                | Determined annually by legislature                                                                       |                                          |  | 30,000      |
| 5. Miscellaneous, non-recurring        | None                                                                                                     |                                          |  | 12,187      |
| B. School board                        | Based on proportion that no. of educable children in parish 6 to 18 years bears to total in state        |                                          |  | 381,315     |
| 1. State public school fund grants:    | Determined annually by State Board of Education                                                          |                                          |  | 1,119,454   |
| a. Per educable fund                   | Determined annually by State Board of Education                                                          |                                          |  | 22,392      |
| b. Equalization fund                   | None                                                                                                     |                                          |  | 35,642      |
| c. Supplemental distribution           | Determined annually by legislature and State Board of Education; a portion to be paid by students        |                                          |  | 213,640     |
| 2. Other state and federal grants      | Varied, depending on services; fixed by legislature                                                      |                                          |  | 31,096      |
| 3. School lunch program funds          | Percent that is equal to assessor's salary fund - total taxes assessed; salary fund fixed by legislature | 2.71781% of each tax assessed            |  | 22,200      |
| C. Clerk of court's fees for services  | 10% of first \$450,000, plus 6% of excess                                                                | 10% of first \$450,000 plus 6% of excess |  | 80,381      |
| D. Tax assessor's commissions on taxes | \$1,000 for each representative                                                                          | \$1,000                                  |  | 1,000       |
| E. Sheriff                             | Varied, depending on service; fixed by legislature                                                       |                                          |  | 4,206       |
| 1. Commissions on taxes collected      | Determined by police jury                                                                                |                                          |  | 1,337       |
| 2. Allowance from state                |                                                                                                          |                                          |  |             |
| 3. Fees for services                   |                                                                                                          |                                          |  |             |
| 4. Allowance from police jury          |                                                                                                          |                                          |  |             |
| IV. Total, Parish Agencies             |                                                                                                          |                                          |  | \$3,057,460 |

a1958 revenue. Levied but not used by parish government.  
bTax became effective for last half of year only.  
cAll school board and clerk of court revenue is for the fiscal year 1959-1960.  
dA district may borrow up to 25% in case of schools, otherwise 10% of assessed value of property in district, then levy taxes sufficient to cover annual principal and interest payments.  
e\$126,300 of which was for fiscal 1960 for school board.

The constitutional limitation on the rate of parish ad valorem taxation for *general purposes*, as set forth in Article 14, Section 11, is four mills per dollar of assessed value of property per year, except that "this limitation shall not apply to nor include any other tax."

**Road Maintenance Tax and Road Construction Tax.**—Authorization for these taxes states:

For the purpose of construction or improving public buildings, school houses, roads, bridges, levees, sewage, or drainage works or other works of permanent public improvement, title to which shall be in the public, or for the maintenance thereof, any political subdivision may levy taxes, in excess of the limitations otherwise fixed in this Constitution, not to exceed in any year five mills on the dollar for any one of said purposes, and not to exceed in any year twenty-five mills on the dollar, . . . for all said purposes . . .<sup>10</sup>

The constitution thus limits the rate for public improvements and road taxes. It further provides that the tax can be levied by the police jury only after the rate, purpose, and duration have been submitted to the resident property taxpayers qualified to vote in the subdivision affected, and a majority of those voting, in both number and dollar value of property, shall have voted in favor of the tax levy. The maximum duration of such tax is 10 years. At the end of that time, it must be presented to the qualified voters again if renewal is desired.

The road construction and maintenance taxes were instituted in Lincoln Parish in 1927 as one five-mill tax levy for both purposes; it was renewed by the voters in 1937 and 1947. In 1957, the tax was separated into two five-mill levies—one for construction and one for maintenance—presented to the voters, and approved by a majority vote for another ten years. By levying five mills for *maintenance* of roads, and five mills for *construction* of roads, the constitutional limitation of five mills for any one purpose, and not to exceed a total of twenty-five mills was not violated.

In 1959, these ad valorem taxes yielded the parish about \$81,000 each for construction and maintenance of roads, after cost of collection, or a total of \$162,027 (Table 1, page 20). The constitution limits the use of these revenues to the purpose for which levied. They can only be transferred to the general fund expenditures with consent of the taxpayers.

**Bond Revenue Taxes.**—Parish governments in Louisiana are permitted to levy property taxes, in excess of the maximum rates otherwise allowed, for the purpose of paying principal and interest on funds borrowed for capital outlay purposes through the sale of bonds.<sup>11</sup> The amount of bonded indebtedness at any one time is limited to a maximum of 10 percent of assessed value of taxable property in the taxing district concerned. Permission must be granted by the State Bond and Tax Board before bonds can be issued, following a favorable vote by a majority of the property owners qualified to vote.

<sup>10</sup>Louisiana Constitution of 1921, Article 10, Section 10.

<sup>11</sup>Revised Statutes 1950, Titles 39 and 47.

In 1959, the police jury of Lincoln Parish had outstanding two separate bond issues supported by property taxes. The parish borrowed \$700,000 with the issuance of bonds April 1, 1948, for the construction of a modern courthouse and jail; these were 25-year bonds maturing annually until 1973. A tax of four-mills per dollar of assessed value of property was levied by the police jury to meet the annual costs of the debt. The rate was later reduced to three mills, then to two and a half mills, and finally to two mills in 1959, as a result of increases in assessment values. The two mill rate provided \$37,316 in 1959. Accrued funds from the tax of previous years have been more than sufficient to cover annual costs each year.

In June, 1959, the police jury issued \$800,000 of hospital bonds, as authorized by an election held on February 24, 1959. The proceeds of the sale are being used to finance the parish's share of a parish hospital, costing approximately \$1,500,000, and constructed under the Hill-Burton Act of the U.S. Congress.

The police jury levied a tax of four mills per dollar of assessed value of property to provide a sinking fund for retirement of the bonds. Revenue of \$25,487 was received from this tax in 1959.

**Ward 6 Recreation Fund Tax.**—The police jury of a parish has constitutional authority to form special districts for specific governmental functions, such as fire protection, recreation, or drainage and water control, and to provide for the financing of these activities by ad valorem taxation of the property within the stated district.

Lincoln Parish has one special district known as the Ward 6 Recreational District. The police jury levies an annual tax of one mill to provide income with which to support recreational activities in the district. In 1959, this tax yielded a net of \$1,209.65. It was spent for athletic equipment, transportation, utilities, and salaries of supervisory personnel. A balance of \$1,992 remained in the fund at year's end.

### **Gasoline Tax**

The gasoline tax of seven cents per gallon in Louisiana is levied under authority granted in Article 6, Section 22, and Article 6-A of the Constitution of 1921. Legislative acts of 1928, 1936, and 1948, as amended, levied the tax on gasoline by increments. All acts levying gasoline taxes have been consolidated as part of Revised Statutes of 1950, Title 47, Sections 711, et seq.

Acts of 1952, 1956, and 1958 amended the 1936 act to dedicate one-half of the two cents tax levied by Section 711-B of Title 47 to the credit of a:

special fund to be known as the Parish One Cent Gasoline Fund. All such taxes . . . shall be apportioned, allotted, and disbursed by the state treasurer to the parishes and the City of New Orleans in the proportion that the number of gallons of gasoline and motor fuel sold in each parish and the City of New Orleans bears to the total number of gallons of gasoline and motor fuel sold in all the parishes and the City of New Orleans for the preceding



calendar year, as reflected by the annual reports filed by the several governing bodies under the provisions of RS 47:722, copies of which shall be filed with the state treasurer.<sup>12</sup>

The collector of revenue forwards to the state treasurer the full amount collected by the one-cent tax in the preceding month for each parish within the first ten days of each month.

Reports of sales for the preceding year must be filed with the police jury of the parish by retailers of motor fuels before February 20 of each year. Wholesalers must file annual reports of sales before March 1 of each year. The parish then files a claim with the state treasurer for the amount of taxes due it each month from the one-cent fund.

In 1959, Lincoln Parish's receipts from the tax amounted to \$106,444. According to legislative requirements, this amount must be used for the "construction and maintenance of roads and bridges" in the parish. It is therefore budgeted as a special road fund by the police jury, which uses it for any expense that can be considered as maintenance of the road system, including the upkeep of prisoners who work on road construction, and equipment and office supplies for the road department. At the close of 1959, a balance of approximately \$93,000, or an amount equal to about nine-tenths of the year's collection, remained in this fund for the parish as a result of the excess of past years' collections over expenditures.

### Severance Tax

The legislature enacted in 1922 a state severance tax on natural resources, including timber, under provisions of Article 10, Sections 1 and 21 of the state constitution. It has been amended five times since then. These enactments and amendments of severance taxes are found in Titles 47 and 56 of Revised Statutes of 1950.

Parishes and other local governments are prohibited by Section 21 from levying such a tax. However, Section 21 provides that:

not less than one-third of the amount of severance tax collected on sulphur not to exceed \$100,000 to any parish in any one year and not less than one-fifth of the amount of the severance tax on oil, gas, or other minerals or any natural resources severed from the soil or water, collected therein

must be allocated by the legislature to the parish where collected, provided that not more than \$200,000 in total severance taxes goes to any parish in any one year.

Section 1, as amended in 1926 by Act 162, provided, in part, as follows:

For the purpose of encouraging the reforestation of denuded lands, contracts fixing the assessed valuation of the specific lands for the duration of the agreements, and fixing a total severance tax based on the value of forest products when severed, three-fourths of which shall go to the parish where they are severed, and which severance tax, for a period not to exceed fifty years from the date

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<sup>12</sup>Revised Statutes 1950, Title 47, as amended in 1958.



of such contract, shall be in lieu of all other taxes on said forest products, are hereby authorized . . .<sup>13</sup>

Act 120 of 1926, dealing with this reforestation contract severance tax, levied a tax of 6 percent of the value of the forest products when severed in lieu of all other taxes on said products.<sup>14</sup> This tax, still existing, applies only to the timber covered by the contracts for reforestation between a landowner and the State of Louisiana.<sup>15</sup>

Subsection 2 of Section 21 was added in 1948 (Act 546) prohibiting the severance tax on timber from going to the parishes where the timber was severed. Instead, it was dedicated to the Louisiana Forestry Commission.

In 1954 the legislature amended Section 1 by Act 759, known as the "Forestry Taxation Law," which repealed the 1948 amendment (Section 21.2 referred to above) by exempting all except virgin timber from the general severance tax.<sup>16</sup> This particular amendment states:

Timber, other than virgin timber, shall be recognized as a growing crop. A severance tax on trees and timber severed from the soil or water is hereby levied at the rate of  $2\frac{1}{4}\%$  on all forms of timber except pulpwood, and 5% for pulpwood, of the then current average stumpage market value of such timber, to be determined annually on the second Monday of January by the Louisiana Forestry Commission and the Louisiana Tax Commission, such tax to be collected in accordance with the laws for the collection of severance taxes on natural resources existing at the time of the collection.<sup>17</sup>

The act provides that three-fourths of the tax collected according to rates in Table 3 is remitted by the state treasurer to the governing authority of the parish where the timber is severed. One-fourth goes to the state general fund and is allocated mostly to education. The land

**TABLE 3.—Ad Valorem Rates for Yield Tax on Timber Other Than Virgin, Forestry Taxation Law, 1954, Louisiana**

| Timber                    | Tax Rate                                                        |
|---------------------------|-----------------------------------------------------------------|
| All forms except pulpwood | $2\frac{1}{4}\%$ of current average stumpage value <sup>a</sup> |
| Pulpwood                  | 5% of current average stumpage value                            |

<sup>a</sup>Determined jointly by Louisiana Forestry Commission and Louisiana Tax Commission in January of each year.

Source: Louisiana Constitution of 1921, Article X, Section 1, Paragraph 5, as amended by Acts 1954, number 759.

<sup>13</sup>Louisiana Constitution of 1921, Article 10, Section 1, Paragraph 3.

<sup>14</sup>Revised Statutes 1950, Title 47:651.

<sup>15</sup>Details of this program are spelled out in Title 56, Chapter 4, Part IV, of the Revised Statutes of 1950.

<sup>16</sup>Opinion of state attorney general, January 12, 1955.

<sup>17</sup>Louisiana Constitution of 1921, Article 10, Section 1, Paragraph 5, as amended by Acts of 1954, number 759.

**TABLE 4.—General Severance Tax Rates on Virgin Timber, Louisiana**

| Timber                                                             | Tax Rate                                                       |
|--------------------------------------------------------------------|----------------------------------------------------------------|
|                                                                    | (Cents per M.B.F. log scale)                                   |
| Cypress                                                            | 100                                                            |
| Pine                                                               | 50                                                             |
| Ash and hickory                                                    | 75                                                             |
| Red gum                                                            | 150                                                            |
| Cow oak                                                            | 50                                                             |
| White oak                                                          | 100                                                            |
| Cottonwood, magnolia, poplar, sycamore,<br>and all other hardwoods | 25                                                             |
| Tupelo, black and sap gum                                          | 25                                                             |
| Pulpwood                                                           | 15 cents per standard<br>cord of 4 feet by 4<br>feet by 8 feet |

Source: Ellis T. Williams, *State Forest Tax Law Digest*, 1956, U.S.D.A. Forest Service, Washington, D. C., 1957, page 79. Louisiana R. S. of 1950, Title 47, Section 633.

on which the timber is grown remains subject to the general property tax. It cannot be assessed henceforth at a higher rate because of increased value of timber on it than existed at the time the act was passed.

While virgin timber is taxed under Section 21, the statutes do not specify how "virgin timber" is defined or determined. According to Revised Statutes of 1950, Title 47, Section 633, it would be taxed at the general severance tax rates shown in Table 4. These funds are credited to the Louisiana Forestry Commission for use in scientific research and reforestation.

These severance and timber yield taxes provided the Lincoln Parish Police Jury with \$94,840 in 1959. Not all severance taxes refunded to the parish go to the police jury, however. Revised Statutes of 1950, Title 47, Section 646, requires that they be shared with the parish school board by stating that the severance taxes must be apportioned to the governing authorities of the parishes within the first 15 days of each calendar quarter "in proportion to the amount of ad valorem property taxes payable to each such governing authority as shown by the last completed assessment roll." About seven-eighths of Lincoln Parish's collections from the general severance tax come from oil, gas, iron ore rock, bentonite (clay), and sand; pulpwood and logs furnished the remaining one-eighth in the form of the timber yield tax. Severance taxes are placed in the general fund for general government expenditures.

### Business Licenses

License to do business in Louisiana<sup>18</sup> may be required by the legislature and by parish and municipal governing bodies.<sup>19</sup> Local govern-

<sup>18</sup>Those excepted from licenses are clerks, laborers, ministers of religion, school teachers, graduate trained nurses, and those engaged in mechanical, agricultural, or horticultural pursuits, or operating sawmills.

<sup>19</sup>Constitution of Louisiana, Article 10, Section 8; Revised Statutes of 1950, Title 47, Sections 341-405.

ments cannot levy a license fee greater than that imposed for state purposes except on alcohol dealers and where state income tax substitutes for a state license levy. Furthermore, if a municipal government levies a license fee equal in amount to that levied by a parish government, the taxpayer is exempt from the parish fee. The city of Ruston and the other incorporated towns in the parish require licensing, while the Lincoln Parish government collects license revenue only on business units outside the municipalities. In 1959 revenue from this source amounted to \$1,175 and was placed in the general fund for general parish expenses along with the ad valorem and severance taxes.

### **Miscellaneous Sources**

The Lincoln Parish government contributes to the salary of the district attorney and the city court judge of Ruston, with the city judge handling certain cases in his capacity as judge of ward court. Court fines and forfeitures and district attorney's fees amounted to about \$14,000 in 1959. Rentals and royalties, such as the rent of office space to private parties in the courthouse (abstract companies, for example, in the clerk of court's quarters), were budgeted to yield \$1,835; sales of used equipment, \$840; dividends on life insurance policies, \$144; commissions on telephone calls, \$11; and transportation of voting machines for elections, which is paid for by the state treasurer, \$660. Local governments are permitted by the legislature to invest idle funds in U. S. government securities. Interest earned on these in 1959 amounted to \$2,695 for general fund revenue plus \$2,640 for the hospital construction fund.

### **Forestry Tax**

A tax of two cents per acre is levied by the police jury on forest and cutover forest lands in the parish not otherwise classified.<sup>20</sup> The tax is subject to the homestead exemption. It is paid to the Louisiana Forestry Commission, under supervision of a parish board of forestry, for fire protection of forest lands in the parish and for promotion of the forest industry. The state and federal governments contribute an amount equal to twice the amount provided by the parish tax.

### **Acreage Tax for Public Improvements**

The police jury is permitted by Revised Statutes 39:702-705 to call an election for levying an acreage tax not to exceed 50 cents an acre. This tax would be for the purpose of funding into bonds for additional aid to public schools or for other public improvements. The amount of bonds issued under this election is not limited to the 10 percent of assessed value of property as in other cases of borrowing by the parish. In 1959, Lincoln Parish was not levying this tax.

### **Police Jury Expenditures**

Attention will not be devoted to the expenditure of the revenue collected as described in the preceding section. The items of expense will

<sup>20</sup>Louisiana Constitution of 1921, Article 6, Section 2; Revised Statutes of 1950, Title 56, Sections 1512-1526.

be discussed in the following order: those for executive administration of the governing body and those for functional, or nonadministrative, purposes.

### Administrative Costs

The cost for administration of the police jury for one year is outlined in Table 5. These data reveal that the salaries of the secretary-treasurer and one clerk as assistant in maintaining the parish office constituted the largest single expense (\$7,787.50) in 1959.<sup>21</sup>

**TABLE 5.—Administrative Costs of Lincoln Parish Police Jury, 1959**

|                                                     |                    |
|-----------------------------------------------------|--------------------|
| Salaries of secretary-treasurer and assistant ..... | \$ 7,787.50        |
| Mileage and per diem of police jurors .....         | 6,117.60           |
| Official printing .....                             | 673.00             |
| General and Office Expense:                         |                    |
| Advertising .....                                   | 125.78             |
| Association dues .....                              | 180.00             |
| Office supplies and expense .....                   | 2,974.10           |
| Telephone and telegraph .....                       | 627.70             |
| Travel and convention expense .....                 | 805.71             |
| Employer's contributions to:                        |                    |
| Group insurance .....                               | 3,558.20           |
| Social security .....                               | 626.55             |
| Parochial employees retirement system .....         | 300.00             |
| <b>TOTAL .....</b>                                  | <b>\$23,776.14</b> |

The highest administrative cost was for the attendance of the police jurors at the monthly meetings. The jury convenes in regular session one day each month. Occasionally a special meeting is called. Special meetings may be called by the president, or whenever he is required to do so by 12 voters of the parish. Compensation of each juror is fixed at \$30 for each day that he attends a meeting or is in actual service of the parish, up to a maximum of 52 days per year.<sup>22</sup> He is also paid 10 cents per mile from his home to the courthouse and return for each meeting and for inspection of roads and bridges in the parish. The Lincoln jury has followed the practice of waiving the per diem remuneration for road and bridge inspection, thus reducing the expense to the parish. Total mileage and per diem claims by the jurors amounted to \$6,117.60 in 1959, an average of \$556.15 per juror. This is a cost of approximately \$45.34 per juror per month for attendance at meetings and attention to other duties, such as road, bridge, and facilities inspection.

Employer's share of contributions to group insurance, social security, and parish employees' retirement system for administrative personnel, amounting to \$4,484.79, was the next highest expenditure for administration purposes in 1959. This does not include the cost of contributions to

<sup>21</sup>Under provisions of Act 225 of the 1960 legislature (RS 33:1236.1), the jury hired a parish manager beginning in October, 1960. The manager is the former secretary-treasurer who was at retirement age. He had served the parish since the beginning of its primary road system and this was a move to retain his valuable services. This increased administrative salaries.

<sup>22</sup>Louisiana Revised Statutes of 1950, Title 33, Section 1233.



these funds for road maintenance personnel, which are included in the costs of road construction and maintenance. Office supplies and expense amounted to \$2,974.10.

The travel expenses of the secretary-treasurer and the president of the jury and of other jury members who attend official functions outside the parish are charged to administration. Included is the attendance at the annual Louisiana Police Jury Association meeting, and any committee meetings in connection therewith, which may be obligations of the local members. In 1959 this expense came to a total of \$805.71. The association dues of the Lincoln jury, amounting to \$180 annually, should be added to this. These dues are paid from public funds and not by the individual members of the jury. Membership in the association is held by each police juror, secretary, treasurer, clerk, parish engineer, and district attorney. Dues are remitted annually in January by the governing authority through the parish treasurer. The treasurer of the Police Jury Association bills the parish treasurer according to a schedule of dues based on the size of assessments for property tax purposes in the parish, ranging from \$90 per year for assessments up to \$5,000,000, to \$1,050 per year for assessments of \$550,000,000 and above. Lincoln Parish had an assessment of about \$18,000,000 in 1959, requiring annual dues of \$180, which is applicable for the range of assessments of \$17,500,000 to \$20,000,000.

Louisiana statutes require that the police jury must choose a newspaper published in the parish (if one is available) as its official journal and publish the minutes of its meetings within two weeks, along with any ordinances which will become law in the parish. The cost of this official printing amounted to \$673 in 1959. There is only one newspaper published in Lincoln Parish — the Ruston Daily Leader — which automatically becomes the official journal of the jury.

Telephone calls and telegrams cost the parish \$627.70 in 1959, while advertising, consisting principally of advertisements for bids on materials and supplies, cost \$125.78.

Total administrative cost to the parish for keeping the police jury came to a total of \$23,776.00 for the year, or an average of about \$2,161 per juror. Income with which to pay these costs was derived mostly from a parish ad valorem tax of four mills and the severance tax. It should be noted at this point that administrative expense of the police jury required about 46 percent of the revenue collected from the general fund ad valorem tax (\$50,470.74) in 1959.

### **Functional Costs**

Among the many duties assigned to a police jury by the legislature in Section 1236 of Title 33 of Revised Statutes of 1950 is one which *requires* it:

to provide a good and sufficient courthouse, with proper rooms for jurors; and also a good and sufficient jail, at such place as they may deem most convenient for the parish at large; provided, that when the seat of justice is established by law, they shall not have power to remove it.

In 1948, the Lincoln Parish jury provided a bond issue for the construction of a large, modern courthouse with jail facilities, the current status of which is shown in the "Sundry Funds" statement. The maintenance of this and other buildings owned by the parish (the cost is mostly applicable to the courthouse) cost the parish \$25,480 in 1959. About half of the revenue received from the ad valorem tax for general fund purposes was required to meet this cost. The expense for maintenance employees amounted to \$11,439, while utilities comprised the second largest cost of a little more than \$4,000 for the year. The parish government furnishes office space, maintenance personnel, and utilities for all parish offices in the courthouse, the operations of which are discussed in later sections of this chapter. Included in the cost of the courthouse for 1959 is also the sum of \$40,276.56 for redemption of 1948 construction bonds, interest, and other charges paid from revenue afforded by an ad valorem tax levied for this purpose.

The largest share of the expenditures made each year by the police jury is for construction and maintenance of the parish road system. Historically, this has been a predominant function of each jury. With the advances in travel in recent years, however, the state highway department has assumed responsibility for construction and upkeep of many miles of roads formerly maintained by the parishes.

Analysis of the 1959 statement of cash receipts and disbursements of road funds of the Lincoln Parish Police Jury reveals that 70 percent of total expenditures for all causes was for road construction and upkeep. The amount was \$367,657.51, including \$59,990 carried in the general fund as a disbursement for road materials. All other expenditures by the jury amounted to \$159,044.02.

The jury hires a permanent employee as superintendent of roads and a varying number of wage earners for construction and maintenance work. In addition, prisoners of the parish are used as laborers and are housed in a special "road camp" under the supervision of the road superintendent. Their cost is shown under road funds disbursements.

Revenue for the "Special Road Fund" is derived largely from one cent of the state gasoline tax collected in the parish and a special annual appropriation by the legislature as described in the revenue section of this chapter. The gasoline tax revenue, amounting to about \$106,000 in 1959, can be spent on roads for any purpose decided by the police jury. The \$30,000 legislative appropriation is to be spent for any road purpose approved by the parish representative and senator. The "Road Construction Fund" is derived from an ad valorem tax of five mills which must be approved by a majority vote of the voting property owners each 10 years and must be spent for creation or rerouting of roads and bridges. The "Road Maintenance Fund" is also derived from ad valorem tax of five mills approved by the voters each 10 years and is used for the maintenance and improvement of existing roads and bridges. Supplementing these two funds is an annual allocation of \$20,000 to \$40,000 by the State Department of Highways to aid the parish in its road improvement plan. The amount in excess of \$20,000

is appropriated for construction on the basis of "need," upon recommendation of a survey completed by the Auto Safety Foundation in 1955. It has since tended to become an annual allocation. A similar one is made to most other parishes.

Combining the expenditures on the road system from all these separate accounts, one finds the following summary of expenditures by Lincoln Parish for construction and maintenance of its highways in 1959:

|                                                                |                     |
|----------------------------------------------------------------|---------------------|
| Salaries, supervisory personnel .....                          | \$ 9,775.00         |
| Wages of laborers .....                                        | 118,677.26          |
| Fuel and maintenance of equipment .....                        | 57,648.49           |
| Purchases of equipment .....                                   | 9,065.52            |
| Road materials (including \$59,990<br>from general fund) ..... | 144,855.96          |
| Upkeep of prison labor and camp .....                          | 9,121.25            |
| Construction of a water well .....                             | 3,042.04            |
| Assessor's compensation for assessment of taxes .....          | 4,600.32            |
| Administrative and miscellaneous .....                         | 3,909.52            |
| Insurance .....                                                | 6,962.15            |
| <b>TOTAL .....</b>                                             | <b>\$367,657.51</b> |

Other expenditures of the jury are discussed under the agencies to which it makes contributions.

The magnitude of the parish government's financial requirements each year is exemplified in the following recapitulation of the total cost of the police jury function for 1959.

#### Expenditures:

|                                                                                       |              |                     |
|---------------------------------------------------------------------------------------|--------------|---------------------|
| General fund                                                                          | \$177,636.43 |                     |
| Road funds <sup>a</sup>                                                               | 307,667.51   |                     |
| Ward Six recreation fund                                                              | 1,121.03     |                     |
| Total expenditures                                                                    |              | \$486,424.97        |
| Disbursement of taxes collected by sinking funds<br>for bond retirement and interest: |              |                     |
| Courthouse                                                                            | \$ 40,276.56 |                     |
| Hospital <sup>b</sup>                                                                 | 25,487.42    |                     |
| Total sinking funds                                                                   |              | 65,763.98           |
| <b>TOTAL COST OF FUNCTIONS:</b>                                                       |              | <b>\$552,188.95</b> |

## Parish School Board Revenue Sources

Lincoln Parish had one parish-wide school district in 1960 plus six smaller districts, five of which levied special property taxes for school purposes. Article 10, Section 10, and Article 12, Section 15, of the Constitution of 1921 permit local districts to levy maximum rates of taxation the same as the entire parish or district within which they are

<sup>a</sup>Excludes \$59,990 included in general fund for roads.

<sup>b</sup>The hospital function was instituted in June, 1959. By the end of the year, bonds had been sold but there were, of course, none ready for redemption. The cost included for this item, therefore, is the amount that had been collected from the tax which is to be used for redemption and interest on these bonds.

**TABLE 6.—Property Tax Rates, Lincoln Parish, Louisiana, 1959-62**

| School District         | Tax Rates |       |                                      |        | Total  |
|-------------------------|-----------|-------|--------------------------------------|--------|--------|
|                         | City      | State | Parish                               | School |        |
|                         |           |       | (Mills per dollar of assessed value) |        |        |
| # 1 In Ruston           | 20.00     | 5.75  | 18.00                                | 23.50* | 67.25* |
| Outside Ruston          |           | 5.75  | 20.00                                | 23.50* | 49.25* |
| # 3 Simsboro            |           | 5.75  | 20.00                                | 24.00  | 49.75  |
| # 5 Dubach              |           |       |                                      |        |        |
| Ward 6                  |           | 5.75  | 21.00                                | 19.50  | 46.25  |
| Ward 8                  |           | 5.75  | 20.00                                | 19.50  | 45.25  |
| # 6 Choudrant           |           | 5.75  | 20.00                                | 23.50  | 49.25  |
| # 7 Hico                |           |       |                                      |        |        |
| Wards 2, 7, 8           |           | 5.75  | 20.00                                | 25.50  | 51.25  |
| Ward 6                  |           | 5.75  | 21.00                                | 25.50  | 52.25  |
| #24 Hopewell-Downsville |           | 5.75  | 20.00                                | 27.50  | 53.25  |

\*For 1961-62 add 7 mills.

located. Consequently, different rates of taxation for special purposes exist in the different school districts of the parish (See Table 6 and Figure 1).

Total parish tax revenue for the general fund for fiscal 1959-60 amounted to \$319,000 including \$190 from rent and leases; total revenue from state and federal sources was \$1,558,802, giving a total income, exclusive of interfund transfers, for the general school fund of \$1,877,761. A balance of \$165,105 was available from the previous year's funds. This, along with a two-mill maintenance tax providing \$39,011, gave a total of \$2,081,877 of funds available for general administrative control, instructional services, operation and maintenance of plant, fixed charges, and auxiliary agencies such as 4-H Club and adult education work under the State Department of Education. Revenue from bond taxes approached \$212,000 to care for interest and principal on school construction loans. Receipts from the school lunch program were \$213,640.

A summary of the 1959-60 revenue sources is presented in Table 7 which shows a total of about \$2.3 million used by the school board. The general fund budget, as estimated for 1960-61, is given in Table 8 for purposes of comparison.

The sources of revenue utilized by the Lincoln Parish School Board during the fiscal year July 1, 1959, to June 30, 1960, are analyzed in the following pages.

### Ad Valorem Property Taxes

**Parish-Wide Constitutional Tax.**—Article 12, Section 15, of the constitution provides the authority for parish public school revenues. A parish school board may levy up to five mills per dollar of assessed value of taxable property per year for general school operation without consent of the voters. The Lincoln Parish School Board had this maximum levy in 1960. The resulting revenue, amounting to about \$96,000 was combined with grants from the state to be used for current operating expenses of the schools, including instructional services



**TABLE 7.—Summary of Revenues, Lincoln Parish School Board, 1959-60 Fiscal Year**

|                                                                                |                |
|--------------------------------------------------------------------------------|----------------|
| I. General Fund:                                                               |                |
| A. Parish taxes .....                                                          | \$ 318,959.25  |
| B. State and federal sources .....                                             | 1,558,802.35   |
| Total revenue receipts (does not include<br>2-mill maintenance tax fund) ..... | \$1,877,761.60 |
| II. Revenue from 2-mill maintenance tax .....                                  | 39,011.40      |
| Total .....                                                                    | \$1,916,773.00 |
| III. Revenue from bond taxes for capital outlay: <sup>a</sup> .....            | 211,605.42     |
| Total, all sources except school lunch program .....                           | \$2,128,378.42 |
| IV. School lunch program receipts .....                                        | 213,640.26     |
| TOTAL, all sources .....                                                       | \$2,342,018.68 |
| Ad valorem taxes as per cent of total revenues .....                           | 19%            |
| <sup>a</sup> 7.5 mills parish-wide district .....                              | \$144,357.74   |
| 4. mills Ruston No. 1 District .....                                           | 50,569.25      |
| 4.5 mills Simsboro No. 3 District .....                                        | 6,422.05       |
| 4 mills Choudrant No. 6 District .....                                         | 4,075.99       |
| 6 mills Hico No. 7 District .....                                              | 4,934.44       |
| 8 mills Hopewell-Downsville No. 24 District .....                              | 1,245.95       |
| Total Bond Tax Revenue .....                                                   | \$211,605.42   |

and administrative expenses. For additional support to schools, the parish school board by proper vote may levy a property tax up to seven mills per dollar of taxable assessment per year, provided it is approved in public election by a majority of the assessed property-owning voters; its maximum duration must be 10 years, but is renewable by public vote of assessed property owners. In 1949, the Lincoln Parish School Board levied five mills of this tax. It was renewed in 1960 for another 10 years. It provided about \$96,000 of revenue in 1959-1960. This fund is allocated for repairs and maintenance of the physical school plant. Apparently, a police jury could also support schools financially. Article 10, Section 10, makes provision for any special taxes, including schools, roads, bridges, etc., by the police jury.

**Maintenance Tax: Special Repairs and Equipment Tax.**—The constitution, in Article 12, Section 15, provides for the levy of another five mills tax for maintenance of school buildings, stating that such revenue may be used for “the maintenance or operating expense” of school buildings, provided such levy has been approved by the voters and is for a maximum of 10 years, subject to renewal. In 1949, the Lincoln school board, after due election and approval by voters, levied two mills of this tax, which was renewed in 1960 for another 10 years. It yielded about \$39,000 in revenue in fiscal 1960, and was used primarily for the purchase and upkeep of equipment for the schools. The call for election of the tax carried the wording “for purpose of constructing, equipping, and/or improving buildings or for maintenance thereof.”

**Bond Revenue Taxes.**—Under provisions of Article 14, Section 14, of the constitution, a school district may issue bonds to obtain revenue for construction of school plants in an amount not exceeding 25 per

**TABLE 8.—General Fund Budget of Receipts and Expenditures, Lincoln Parish School Board, Fiscal 1960-1961**

|                                                         |                       |
|---------------------------------------------------------|-----------------------|
| <b>REVENUE RECEIPTS</b>                                 |                       |
| State, federal and special state public school funds    |                       |
| Per educable .....                                      | \$ 389,400.00         |
| Equalization .....                                      | 1,184,954.05          |
| Vocational education funds state and federal .....      | 2,500.00              |
| Sixteenth section land fund .....                       | 429.97                |
| <b>TOTAL—State, federal and special</b> .....           | <b>\$1,577,284.02</b> |
| Parish                                                  |                       |
| Parish-wide taxes                                       |                       |
| Constitutional 5 mills .....                            | 97,000.00             |
| Special maintenance 5 mills .....                       | 97,000.00             |
| Severance tax .....                                     | 100,000.00            |
| <b>TOTAL—Parish</b> .....                               | <b>\$ 294,000.00</b>  |
| <b>TOTAL REVENUE RECEIPTS</b> .....                     | <b>\$1,871,284.02</b> |
| <b>TOTAL REVENUE AND NON-</b>                           |                       |
| <b>REVENUE RECEIPTS</b> .....                           | <b>\$1,871,284.02</b> |
| Cash Balance, July 1, 1959 .....                        | \$ 224,665.05         |
| <b>TOTAL RECEIPTS, BALANCE</b>                          |                       |
| <b>AND OVERDRAFT</b> .....                              | <b>\$2,095,949.07</b> |
| <b>CURRENT EXPENDITURES</b>                             |                       |
| General Control .....                                   | \$ 65,095.00          |
| Instructional service—white teachers .....              | 892,922.00            |
| Instructional service—Negro teachers .....              | 592,690.00            |
| Operation of plant .....                                | 106,267.95            |
| Maintenance of plant .....                              | 30,305.00             |
| Auxiliary agencies .....                                | 293,755.00            |
| Fixed charges .....                                     | 30,700.00             |
| <b>TOTAL—Expenditures for current operation</b> .....   | <b>\$2,011,734.95</b> |
| <b>TOTAL ALL EXPENDITURES</b> .....                     | <b>\$2,011,734.95</b> |
| Cash balance, June 30, 1960 .....                       | \$ 84,214.12          |
| <b>TOTAL, EXPENDITURES, BALANCE AND OVERDRAFT</b> ..... | <b>\$2,095,949.07</b> |

cent of assessed valuation of property in the district. School bonds issued on a parish-wide basis on two occasions in past years required a seven and one-half mills property tax for payments of principal and interest in fiscal 1960. This provided revenue of approximately \$144,000 (Table 7, page 35). In addition, five subdistricts had tax levies ranging from four to eight mills in support of bond issues; two had four mills each, one four and one-half mills, one six mills, and one eight mills. Together these levies yielded around \$67,000 in fiscal 1960. Supposedly, each of these taxes will provide increased revenue in succeeding years as assessment values rise.

### Severance Tax

Legislative provisions require that the school board share severance tax revenues with the police jury. The Lincoln school board's share of the tax in 1959-60 amounted to \$126,300. This revenue was placed in the general fund to be spent on general control of the school system, including administrative and instructional services.

## State and Federal Funds for Schools

Article 12, Section 14, of the constitution provides for the following sources of funds to the State Board of Education for distribution to the parishes:

1. A two and one-half mill state-wide ad valorem tax, extended on the assessment rolls and collected by the tax collector for each parish and paid into the state fund;
2. A balance in the severance tax fund after maximum constitutional allocations to the purposes for which it was levied by Article 10, Section 21, of the constitution; some of this is specifically dedicated to be used for free books and school supplies;
3. Proceeds of particular taxes to be levied for the state public school fund;
4. Any other funds dedicated for school purposes after the adoption of this article. The legislature is required to maintain at least \$10,000,000 annually in the fund, even if it has to go into the general fund to supplement the above sources of revenue.

These funds are pooled and allocated to the parish school boards primarily in two categories:

1. Three-fourths in monthly installments to each school board in the proportion that the number of educable children from 6 to 18 years of age in the parish bears to the total of that number of educables in the state (the "per educable" fund);
2. One-fourth to the boards on an equalization basis to provide a minimum educational program in each parish as determined by the state board of education (the "equalization" fund).

The amount of the per educable fund apportioned to Lincoln Parish in 1959-60 was \$381,315; the equalization fund allocation was \$1,119,453.77.

Additional funds are provided by Section 14 of Article 12 of the constitution. Under this clause the legislature shall use the following funds for school purposes:

1. Interest on proceeds of lands heretofore and hereafter granted by the United States for school purposes and revenues from unsold portions of same (sixteenth section land fund). These funds are to be released to acquire, construct, and equip public school-plant facilities.
2. All funds and proceeds of lands and property granted to the state but not designated for any other purpose.
3. Appropriations made for vocational education or other school purposes by the United States Office of Education or other United States government agency.

Funds coming to Lincoln Parish from these sources in 1959-60 amounted to about \$7,200.

## School Lunch Funds

The final source of funds available to the parish school board from the State Board of Education is the public school lunch program. This revenue, amounting to \$213,640 in fiscal 1960, was derived from the sale of lunches, federal grants for food, and state grants. Data for the

1959-60 school year lunch program in Lincoln Parish are shown in Table 9.

Local property taxes provided \$454,000 or 19.8 percent of the total expected new revenue to the school board in fiscal 1961, compared with 18.1 percent in fiscal 1960. Of the general fund revenue, 10.4 percent, or \$194,000, came from local property taxes. This is exclusive of the two and one-half mills state property tax for education which was pooled with that from other parishes for distribution to the school districts under the per educable and equalization funds.

## Parish School Board Expenditures

The statement of operating expenses of the Lincoln Parish School Board for the fiscal year ending June 30, 1959, shows the costs incurred by the board for a year's operation of the school system, exclusive of capital outlay and school lunch program expenses. Expenditure items will be analyzed according to administrative costs and functional or non-administrative costs.

### Administrative Costs

Administrative costs of the school board for a year were:

|                                                                           |             |
|---------------------------------------------------------------------------|-------------|
| Salary of superintendent .....                                            | \$11,975.00 |
| Salary of visiting teacher .....                                          | 7,700.00    |
| Travel expense of superintendent and visiting teacher .....               | 1,074.82    |
| School board mileage and per diem .....                                   | 4,326.40    |
| Salaries of clerks .....                                                  | 11,000.00   |
| Office expense .....                                                      | 3,878.78    |
| School Board Association dues .....                                       | 400.00      |
| Convention and conference expense .....                                   | 1,893.94    |
| Surety bond premiums .....                                                | 200.00      |
| Employer's contributions to:                                              |             |
| Social security .....                                                     | 459.05      |
| Retirement system for superintendent and<br>visiting teacher (est.) ..... | 2,000.00    |
| TOTAL .....                                                               | \$44,907.99 |

This itemization of the general control expenses of the school board indicates the items of expense incurred by the board before any instruction or building costs have been counted. The largest item of expense is that of the superintendent. In addition to his salary, he is allowed a travel expense while on duty in attendance at school administration. His share of the travel expense listed above was \$631.49. The next largest item is that of salaries of clerks to maintain the records of the board and the superintendent in the headquarters office. This expense amounted to \$11,000 in fiscal 1959. Three office assistants, including a bookkeeper, were employed by the school board.

Mileage and per diem expenses of the board members, as set forth in a previous section, amounted to \$4,326.40 for fiscal 1959. This was an expenditure of \$393.31 per year per member or \$32.78 per month per member.



**TABLE 9.—School Lunch Program, Lincoln Parish, 1959-1960**

|                                                      |                     |
|------------------------------------------------------|---------------------|
| <b>RECEIPTS</b>                                      |                     |
| Students .....                                       | \$ 59,892.90        |
| Adults .....                                         | 8,303.10            |
| State .....                                          | 125,145.47          |
| Federal .....                                        | 20,298.79           |
| <b>TOTAL RECEIPTS</b> .....                          | <b>\$213,640.26</b> |
| <b>EXPENDITURES</b>                                  |                     |
| Food .....                                           | \$151,358.99        |
| Labor .....                                          | 46,421.98           |
| Other .....                                          | 6,411.55            |
| <b>TOTAL EXPENDITURES</b> .....                      | <b>\$204,192.52</b> |
| Number of lunchroom workers:                         |                     |
| White .....                                          | 24                  |
| Negro .....                                          | 31                  |
| <b>TOTAL</b> .....                                   | <b>56</b>           |
| Daily average number of children participating ..... | 4,907               |
| Total number of school lunch workers .....           | 56                  |
| Number of lunches served children .....              | 863,622             |
| Free lunches .....                                   | 75,624              |
| Number lunches served adults .....                   | 46,395              |
| Total lunches served children and adults .....       | 910,017             |
| Average parish cost for each lunch .....             | \$0.236             |

Source: *Report of Superintendent to Lincoln Parish School Board, July 11, 1960.*

Miscellaneous expenses attributable to administration include \$200 for surety bond premiums for members and officers charged with financial responsibilities, \$400 for School Board Association dues which are charged to the public, \$1,893 for expense of travel to conventions and conferences by board members and executive officers, and \$2,459.05 as the board's share of contributions to social security and retirement systems, exclusive of teachers. The total administrative cost of approximately \$45,000 was about 2.5 percent of total operating expenses.

### Functional Costs

The largest category of expenditures by Lincoln Parish School Board is instructional service. The cost of this service was \$1,201,528.12, or 67 percent of total operating expense, during the fiscal year of 1959. This was divided 40 percent for white schools and 27 percent for Negro schools. Included in this expense for instructional service are the salaries, travel expense, and secretarial help for the supervisors of public schools of the parish. This sum amounted to \$11,873.45 for the supervisor of white schools, plus \$6,494.28 for the supervisor of Negro schools.

About 60 percent of total instruction expense was for white pupils. White students comprise 51.3 percent of the total number of pupils in schools during the year, and 50.3 percent of the total number of children classed as educables in Lincoln Parish. Of the total number of regular teachers, 58.3 percent were white, 51 percent of which held master's degrees, while 41 percent of the Negro teachers held this degree. Instruc-

tional salaries are influenced partially by degrees possessed by the teachers.

The instructional cost per educable for whites and Negroes, as discerned from data available for the 1959-60 fiscal year, was \$226 per educable for whites and \$153 for Negroes.

## **Clerk of Court**

Revenue for operation of the office of clerk of court is derived from fees charged for services and duties performed. These fees, established by the legislature, provided the Lincoln Parish clerk of court with about \$31,000 for the district court term of July 1, 1959, to May 31, 1960. This income was used to pay salaries of the clerk, his deputies and assistants, to purchase office supplies, and to pay the cost of the clerk's association dues and convention expenses.

Table 10 contains a statement of cash receipts and disbursements of the Lincoln Parish clerk of court salary fund for the court term of July 1, 1959, to May 31, 1960. The clerk's office also serves as a depository for funds collected in court litigations, such as peace bonds, bails, court adjudications of property, and fines. These funds are transferred to authorized recipients after court costs are deducted. Table 11 shows collections of \$95,887 in the advance deposit and registry of court funds for fiscal 1960.

## **Tax Assessor**

The office of tax assessor is operated with funds collected from all the governing bodies that receive property taxes from Lincoln Parish. These agencies are the State of Louisiana, Lincoln Parish Police Jury, Lincoln Parish School Board, the City of Ruston, and the Louisiana Forestry Commission. The legislature authorizes the tax assessor to make a charge to each for the assessment of property upon which each agency levies a tax. The charge for assessment is based on a formula which relates the amount of taxes levied for each agency to the total amount of the assessor's salary and expense fund, as fixed by the legislature.

In 1959, total receipts by the tax assessor amounted to \$22,300, as shown in Table 12. This was spent primarily for salaries for the assessor, his deputies and other employees, office supplies and equipment, the purchase and maintenance of an automobile for assessment work, travel and convention expenses, and communications expense. About 48 percent of this was paid by the school board in 1959. In 1957, the share for the school board was 52 percent. Addition of a hospital bonds tax in 1959 raised the share paid by the police jury. The assessor maintains his own depository of funds, writes the checks in payment of his office expense, and writes his own salary check. He must account to the state supervisor of public funds for funds subject to his control.

Since the payments to the assessor are not due until assessments are made and accepted by the Louisiana Tax Commission, the police jury and the school board advance to the assessor in the beginning of the

**TABLE 10.—Lincoln Parish Clerk of Court Salary Fund, Statement of Cash Receipts and Disbursements for the Period from July 1, 1959, to May 31, 1960**

|                                       |                    |
|---------------------------------------|--------------------|
| <b>BALANCE AT BEGINNING OF PERIOD</b> | <b>\$13,637.53</b> |
| <b>RECEIPTS</b>                       |                    |
| Recordings                            | 14,743.05          |
| Cancellations                         | 841.00             |
| Mortgage certificates                 | 1,850.50           |
| Marriage licenses                     | 623.00             |
| Notarial fees                         | 490.00             |
| Certified copies                      | 3,611.00           |
| Suits and successions                 | 6,020.86           |
| Court attendance                      | 456.00             |
| Criminal fees                         | 327.50             |
| Certificates of title                 | 946.00             |
| Other fees                            | 1,187.25           |
| Salary deductions:                    |                    |
| Federal income tax                    | 5,151.55           |
| Retirement contributions              | 1,600.62           |
| Total receipts                        | <u>37,848.33</u>   |
| Total                                 | <u>\$51,535.86</u> |
| <b>DISBURSEMENTS</b>                  |                    |
| Salaries:                             |                    |
| Clerk of court                        | \$ 8,800.00        |
| Deputies                              | 18,400.00          |
| Other employees                       | 4,812.50           |
| Office supplies and expense           | 2,299.21           |
| Association dues                      | 93.50              |
| Expense of convention                 | 45.00              |
| Remittances for salary deductions:    |                    |
| Federal income tax                    | 5,151.55           |
| Clerks' Retirement and Pension Fund   | 1,600.62           |
| Total disbursements                   | <u>41,202.38</u>   |
| <b>BALANCE AT END OF PERIOD</b>       | <b>\$10,333.48</b> |

Source: Audit Report of State Supervisor of Public Funds, Lincoln Parish Clerk of Court, 1960, Exhibit B.

year a sum from which his salary and expenses are paid. Whenever he receives the amount due from the other agencies, any balance or deficit in the account of the police jury and school board is adjusted to actual amount due from each. Any savings in the expense account for any one year may be retained and added to a fixed allowance for the following year. By this means it is possible to allocate expenses for equipment, supplies, and office help over a period of years and thus relieve the school board and police jury from frequent demands for financial assistance beyond their share of taxes assessed each year. These agencies are required by law to keep the assessor's office supplied with proper equipment. Only at the termination of duty of the incumbent assessor are surplus funds returned to the taxing authorities on a pro rata basis.

TABLE 11.—Lincoln Parish Clerk of Court Sundry Funds, Statement of Cash Receipts and Disbursements, by Funds, for the Period from July 1, 1959, to May 31, 1960

|                                          |             |
|------------------------------------------|-------------|
| <b>ADVANCE DEPOSIT FUND</b>              |             |
| Balance at beginning of period           | \$ 3,617.04 |
| Receipts—deposits                        | 12,943.02   |
| Total                                    | 16,560.06   |
| Disbursements:                           |             |
| Clerk's costs transferred to salary fund | 6,020.86    |
| Sheriff's costs:                         |             |
| Local                                    | 1,360.90    |
| Other parishes                           | 245.20      |
| Other costs                              | 2,198.59    |
| Refunds to litigants                     | 1,910.13    |
| Total disbursements                      | 11,735.68   |
| Balance at end of period                 | \$ 4,824.38 |
| <b>REGISTRY OF COURT FUND</b>            |             |
| Balance at beginning of period           | \$49,304.71 |
| Receipts—deposits                        | 82,944.55   |
| Total                                    | 132,249.26  |
| Disbursements:                           |             |
| Clerk's costs                            | 522.13      |
| Taxes                                    | 65.48       |
| Heirs, litigants, etc.                   | 99,205.31   |
| Total disbursements                      | 99,792.92   |
| Balance at end of period                 | \$32,456.34 |

Source: Audit Report of State Supervisor of Public Funds, Lincoln Parish Clerk of Court, 1960, Exhibit C.

## Sheriff

Legislative acts require each sheriff in Louisiana to maintain two funds; namely, the sheriff's fund and the sheriff's salary fund. The first is comprised of receipts collected as required by law in criminal and civil litigations, sheriff's sales of seized property, and cash bonds of those accused of law violations (Table 13). Disbursements of these funds to those officials and parties destined to receive them are recorded in the sheriff's fund statement. Some of these funds are simply transfers between the clerk of court and the sheriff.

The sheriff's salary fund consists of revenues which rest finally with the sheriff for the support of his office and official duties. It is this revenue that covers the cost of governmental operation of the sheriff's office in the parish. Revenues consist of commissions allowed the sheriff on taxes collected and licenses issued in his ex-officio capacity as tax collector; civil and criminal fees permitted by law for such items as serving subpoenas, writs, and warrants; per diem allowance for court attendance; transportation and feeding of prisoners; and an allowance of \$1,000 from the state for each representative the parish has in the state legislature. Income from all of these sources amounted to nearly



**TABLE 12.—Lincoln Parish Assessor's Salary Fund, Statement of Revenue and Expenditures for the Year Ending December 31, 1959**

|                                                         |                    |
|---------------------------------------------------------|--------------------|
| <b>REVENUE</b>                                          |                    |
| Allowance from:                                         |                    |
| State                                                   | \$ 2,300.19        |
| Police jury                                             | 8,893.79           |
| School board                                            | 10,579.96          |
| City of Ruston                                          | 364.99             |
| Forestry Commission                                     | 61.07              |
| Total allowance                                         | \$22,200.00        |
| Sale of old typewriter                                  | 100.00             |
| Total revenue                                           | \$22,300.00        |
| <b>EXPENDITURES</b>                                     |                    |
| Salaries:                                               |                    |
| Assessor                                                | 7,200.00           |
| Deputies                                                | 11,450.00          |
| Other employees                                         | 2,400.00           |
| Office supplies and expense                             | 951.47             |
| Telephone and telegraph                                 | 508.57             |
| Automobile expense:                                     |                    |
| Purchase of automobile                                  | 2,250.00           |
| Gasoline and oil                                        | 542.88             |
| Other                                                   | 461.78             |
| Other travel and convention expense                     | 966.66             |
| Insurance and bond premiums                             | 740.35             |
| Association dues                                        | 35.00              |
| Total expenditures                                      | \$27,506.71        |
| <b>EXCESS (Deficiency) OF REVENUE OVER EXPENDITURES</b> | <b>(5,206.71)</b>  |
| <b>SURPLUS AT BEGINNING OF YEAR</b>                     | <b>7,001.02</b>    |
| <b>SURPLUS AT END OF YEAR</b>                           | <b>\$ 1,794.31</b> |

Source: Audit Report of State Supervisor of Public Funds, Lincoln Parish Assessor's Office, 1960, Exhibit A.

\$87,000 for the Lincoln Parish sheriff's salary fund in the fiscal year of 1960 (Table 14).

Withholdings from tax collections are limited to 10 percent of the first \$450,000 of taxes collected per year plus 6 percent of all over this amount. As taxes are paid, the tax collector withholds the appropriate percentage for deposit to his salary and expense fund, then pays the remainder monthly to the respective tax recipient bodies in accord with the rate of levy by each.

Expenditures from the salary fund are made for many items that have no relationship to salaries. The act establishing the fund provides for its use for the payment of not only the salaries of the sheriff and his deputies, but also any and all items considered essential by the sheriff for the proper performance of his duties (see Table 14). They include such things as automobiles and their maintenance, insurance and bond premiums for officers, uniforms, communications equipment, sheriff's association dues, food and transportation for prisoners, and general office personnel and supplies. The sheriff's salary is fixed by the legisla-

**TABLE 13.—Lincoln Parish Sheriff's Fund, Statement of Cash Receipts and Disbursements for the Year Ended June 30, 1960**

|                                     |                    |
|-------------------------------------|--------------------|
| <b>BALANCE AT BEGINNING OF YEAR</b> | <b>\$ 1,042.50</b> |
| <b>RECEIPTS</b>                     |                    |
| Criminal costs:                     |                    |
| District attorney                   | 785.00             |
| Clerk of court                      | 400.50             |
| Sheriff                             | 422.00             |
| Civil fees                          | 1,780.40           |
| Litigations, sheriff's sales, etc.  | 15,026.91          |
| Cash bonds                          | 1,930.00           |
| Total receipts                      | <u>20,344.81</u>   |
| Total                               | <u>\$21,387.31</u> |
| <b>DISBURSEMENTS</b>                |                    |
| Criminal costs:                     |                    |
| District attorney                   | \$ 785.00          |
| Clerk of court                      | 400.50             |
| Sheriff's salary fund               | 422.00             |
| Civil fees to sheriff's salary fund | 1,780.40           |
| Litigations, sheriff's sales, etc.: |                    |
| Litigants                           | 5,634.58           |
| Registry of court                   | 6,750.25           |
| Civil fees to sheriff's salary fund | 669.80             |
| Clerk of court                      | 907.80             |
| Other sheriffs and clerks of court  | 100.30             |
| Advertising                         | 416.00             |
| Storage and appraiser fees          | 302.19             |
| Redemption of adjudicated property  | 17.50              |
| Federal revenue stamps              | 27.50              |
| Taxes                               | 218.49             |
| Cash bonds                          | 1,955.00           |
| Total disbursements                 | <u>20,387.31</u>   |
| <b>BALANCE AT END OF YEAR</b>       | <b>\$ 1,000.00</b> |

Source: Audit Report of State Supervisor of Public Funds, Lincoln Parish Sheriff's Office, 1960, Exhibit B.

ture as full compensation for his duties. In addition, he has an official travel expense through the use of the automobiles purchased and maintained from the revenues in the salary fund.

## Department of Public Welfare

In addition to the parish governing bodies, another governmental agency that is recipient and disburser of public revenues in Lincoln Parish is the parish office of the Louisiana Department of Public Welfare. As was stated previously, office space for this agency is furnished in the courthouse by the police jury. However, beginning July 1, 1960, the Department of Public Welfare pays \$200 per month to the police jury toward the costs of utilities and maintenance of the courthouse.

**TABLE 14.—Lincoln Parish Sheriff's Salary Fund, Statement of Revenue, Expenditures and Surplus for the Year Ended June 30, 1960**

|                                                    |             |
|----------------------------------------------------|-------------|
| <b>REVENUE</b>                                     |             |
| Commissions on taxes, licenses, etc.               | \$80,380.96 |
| Costs, notices, etc.                               | 156.00      |
| Civil and criminal fees                            | 2,872.20    |
| Court attendance                                   | 310.00      |
| Representative allowance                           | 1,000.00    |
| Transporting prisoners and interdicts              | 868.25      |
| Feeding prisoners                                  | 1,336.71    |
| Total revenue                                      | \$86,924.12 |
| <b>EXPENDITURES</b>                                |             |
| Salaries:                                          |             |
| Sheriff                                            | \$9,000.00  |
| Deputies                                           | 37,325.00   |
| Other employees                                    | 10,800.00   |
| Office supplies and expense                        | 4,529.31    |
| Purchase of automobiles                            | 7,048.00    |
| Gasoline and oil                                   | 3,118.17    |
| Other automobile expense                           | 1,357.73    |
| Other travel expense                               | 48.82       |
| Transporting prisoners and interdicts              | 71.45       |
| Feeding prisoners                                  | 1,336.71    |
| Insurance and bond premiums                        | 2,961.68    |
| Association dues                                   | 288.00      |
| Purchase of law enforcement equipment and supplies | 615.94      |
| Uniforms                                           | 903.00      |
| Radio equipment and maintenance                    | 1,371.89    |
| Employer's contribution to social security         | 291.75      |
| Total expenditures                                 | \$81,067.45 |
| <b>EXCESS OF REVENUE OVER EXPENDITURES</b>         | 5,856.67    |
| <b>SURPLUS AT BEGINNING OF YEAR</b>                | 26,575.65   |
| <b>SURPLUS AT END OF YEAR</b>                      | \$32,432.32 |

Source: Audit Report of State Supervisor of Public Funds, Lincoln Parish Sheriff's Office, 1960, Exhibit A.

The parish government does not provide any funds for the welfare program. All welfare funds received in Lincoln Parish are derived from the State Department of Public Welfare. A portion of these funds is provided to Louisiana by the United States government.

Data in Table 15 show that a total of \$1,539,023 was spent in Lincoln Parish by the welfare department in fiscal 1960. The federal contribution to the parish welfare program, amounted to \$991,131, or 64.4 percent of the total state welfare appropriation. The degree of federal participation varies for the different categories, however. Federal funds supplement state funds in the following proportions: old age assistance, 68.4 percent; aid to the blind, 59.8 percent; aid to dependent children, 77.7 percent; aid to permanently and totally disabled, 72.8 percent; administration, 44.7 percent; child welfare services, 21.4 percent; and foster care, 0.2 percent. General assistance is provided entirely by state funds.

TABLE 15.—Public Welfare Funds Disbursed in Lincoln Parish, Louisiana, Fiscal Year 1959-1960

| Type of Aid                             | Total              | Assistance         |                         |                                   |
|-----------------------------------------|--------------------|--------------------|-------------------------|-----------------------------------|
|                                         |                    | Money Grants       | Medical Vendor Payments | Administration and Office Expense |
| Old age assistance                      | \$1,049,543        | \$1,025,761        | \$23,782                |                                   |
| Aid to the blind                        | 28,879             | 28,550             | 329                     |                                   |
| Aid to dependent children               | 215,349            | 214,398            | 951                     |                                   |
| Aid to permanently and totally disabled | 80,633             | 77,896             | 2,737                   |                                   |
| General assistance                      | 44,595             | 44,029             | 566                     |                                   |
| Administration                          | 74,984             |                    |                         | 74,984                            |
| Subtotal                                | \$1,493,983        | \$1,390,634        | \$28,365                | \$74,984                          |
| Child welfare services                  | 6,728              |                    |                         | 6,728                             |
| Foster care payments                    | 38,312             | 38,312             |                         |                                   |
| <b>TOTAL</b>                            | <b>\$1,539,023</b> | <b>\$1,428,946</b> | <b>\$28,365</b>         | <b>\$81,712</b>                   |

Source: Report from Director of Louisiana Department of Public Welfare.

State funds for the public welfare program are derived from the Louisiana sales tax of 2 percent on most retail purchases of tangible goods in the state, on goods stored for use in the state, and on commercial services. A total of \$547,892 of the \$1,539,023 of public welfare expenditures in Lincoln Parish in fiscal 1960 was furnished by the state out of sales tax revenue. In the same year, a total of \$481,155.07 was collected as sales taxes in Lincoln Parish.<sup>23</sup> The parish, therefore, received about \$66,737 more in welfare payments from the state (not counting the federal funds) than it paid to the state in sales taxes. The excess of receipts over sales taxes paid was about 13 percent of total state payments to the parish. This means that about 87 percent of the welfare revenue from the state was provided by sales taxes paid on purchases made in Lincoln Parish. When federal government participation is considered, only 31 percent of the total welfare payments in the parish in fiscal 1960 was accounted for by sales taxes collected in Lincoln Parish.

A summary of revenues to Lincoln Parish government agencies is presented in Table 16.

## Historical Trend in Public Revenues

An examination of the sources of revenue used by the Lincoln Parish governing agencies over a period of 30 years reveals trends and suggests problems associated with financing of local government. This survey considers trends based upon data reported for the years 1930, 1940, 1950, and 1960. The first was a year when national income was begin-

<sup>23</sup>*Annual Report of Louisiana Department of Revenue, Fiscal Year 1959-1960*, p. 19.



**TABLE 16.—Summary of Revenues to Lincoln Parish Governmental Agencies, 1959**

|                                                  |                |
|--------------------------------------------------|----------------|
| Police jury, property taxes .....                | \$ 276,511.74  |
| School board, property taxes .....               | 443,085.68     |
| Total property taxes .....                       | \$ 719,597.42  |
| Other taxes .....                                | 327,586.16     |
| Total taxes .....                                | \$1,047,183.58 |
| Police jury, non-tax sources <sup>a</sup> .....  | 97,614.06      |
| School board, non-tax sources <sup>b</sup> ..... | 1,772,442.61   |
| Total, police jury and school board .....        | \$2,917,240.25 |
| Clerk of court .....                             | 31,096.16      |
| Tax assessor .....                               | 22,200.00      |
| Sheriff .....                                    | 86,924.12      |
| Total, parish governments .....                  | \$3,057,460.53 |
| Department of public welfare .....               | 1,539,023.00   |
| TOTAL, ALL AGENCIES .....                        | \$4,596,483.53 |

<sup>a</sup>Business licenses, fines, fees, and state grants.

<sup>b</sup>State and federal aid.

ning to decline, as a prelude to the depression of the 1930's. But tax revenues of the local governments were slow to adjust and were continued in much the same pattern without regard to the business slump that became critical in the mid-30's. The year of 1940 was a year of mild recovery and the beginning of a decade of amazing economic revival resulting primarily from the demands of World War II which lasted from 1941 to 1945. The year 1950 was representative of the years of adjustment following World War II and its inflationary effects. The year 1959 was characterized by a slight recession prior to a period of economic growth and rapid expansion of gross national product predicted for the 1960 decade.

### Police Jury

Total revenue received by the Lincoln Parish police jury in 1930, exclusive of funds borrowed, was \$158,414, about 84 percent of which was derived from the property tax (Table 17). A gasoline tax levied by the parish accounted for the second largest source of funds, or 11 percent of the total. The severance tax furnished negligible income to the parish in 1930, amounting to only \$74, and state grants for public improvements were not available to Lincoln Parish in 1930 nor in 1940.

In 1940 total revenue received by the parish government was about \$4,000 less than that for 1930, amounting to \$154,708. The property tax provided about 75 percent of this, or about 10 percent less than its share 10 years previously. Revenues from the property tax, business licenses, fines and fees all showed decreases, while the gasoline tax yielded an increase of almost \$7,000 to parish income. An added source of income in 1940 was a tax on chain stores operating in Louisiana which the legislature levied in behalf of the parish governments. Lincoln Parish collected \$1,485 from this tax.

TABLE 17.—Revenue to the Lincoln Parish Police Jury, 1930, 1940, 1950, and 1960, Showing Percent Obtained from Each Source

| Source              | 1930      |              | 1940      |         | 1950                 |         | 1960                 |         |
|---------------------|-----------|--------------|-----------|---------|----------------------|---------|----------------------|---------|
|                     | Amount    | Percent      | Amount    | Percent | Amount               | Percent | Amount               | Percent |
| Property tax:       |           |              |           |         |                      |         |                      |         |
| For roads           | \$107,151 |              | \$ 89,627 |         | \$106,802            |         | \$201,632            |         |
| Total               | 133,036   | 84.0         | 115,649   | 74.8    | 195,018              | 60.5    | 389,169              | 58.1    |
| Gasoline tax        | 18,125    | 11.4         | 25,208    | 16.3    | 45,318               | 14.1    | 107,518              | 16.1    |
| Severance tax       | 74        | <sup>a</sup> | 1,543     | 1.0     | 34,603               | 10.7    | 100,738              | 15.1    |
| State grants-in-aid |           |              |           |         | 31,790               | 9.9     | 32,045               | 4.7     |
| Fines and fees      | 3,646     | 2.3          | 1,520     | 1.0     | 5,700                | 1.8     | 16,356               | 2.3     |
| Business licenses   | 1,517     | .9           | 700       | .4      | 1,393                | .4      | 1,076                | .2      |
| Chain store tax     |           |              | 1,485     | .9      | (1,438) <sup>1</sup> |         | (2,613) <sup>1</sup> | .3      |
| Other               | 2,016     | 1.3          | 8,603     | 5.6     | 8,231                | 2.6     | 22,347               | 3.3     |
| Total <sup>2</sup>  | \$158,414 | 100.0        | \$154,708 | 100.0   | \$322,053            | 100.0   | \$870,881            | 100.0   |

<sup>a</sup>Less than .1 percent.

<sup>1</sup>Dedicated to municipalities, but collected by parish.

<sup>2</sup>Less loans and interfund transfers.

The drop in ad valorem tax revenues between 1930 and 1940 reflects partially the trend in economic and social conditions in the state and parish during that period. Legislative changes imposed on assessment procedures during the depression years resulted in very low taxable property values and ad valorem tax receipts. Early in the decade of the 30's, the parish's agricultural lands were revalued to more nearly correspond with declining farm incomes. One amendment to assessment procedures passed by the state legislature required that, beginning in 1933, no increase in the assessed value of a farm could be made for 10 years regardless of capital improvements.

Many properties became tax delinquent and were adjudicated to the state via tax sales before 1940, and general economic conditions were not conducive to significant increases in ad valorem tax rates by the police jury. These factors combined to net the parish government a smaller property tax income in 1940 than it had received 10 years earlier.

An increase in gasoline consumption during the decade of 1930-40 resulted in an appreciable increase in gasoline tax revenue to the parish government. A change in this source had been created by the state legislature in 1936 when it abolished the authority of the parish to levy a two-cent gasoline tax. Instead, the state treasurer refunded a part of the state tax collected within the parish. Then, in 1938, the two cents refund was reduced to one cent, which was the prevailing refund rate in 1940, as compared with two cents per gallon in 1930. Despite this reduced rate, gasoline tax revenue to Lincoln Parish increased about 39 percent from 1930 to 1940.

An examination of receipts and expenditures of the police jury for 1930 and 1940 reveals that short term borrowing by the government from local banks was the consequence of a lack of revenue to support both the cost of the services and the repayment of money borrowed for government functions in previous years. For example, maintenance of the road system in 1940 required the expenditure of about \$68,000. The combined ad valorem, gasoline, and severance taxes dedicated to road construction and maintenance provided only \$62,000. At that time there was no direct allocation to the parish by the State Department of Highways for the road system. The police jury found it necessary to borrow \$14,000 from a local bank to cover the cost of maintaining the road system and to repay previous obligations incurred for road purposes.

Some interesting features of the 1930 budget in comparison with that of 1940 might be noted. Some general fund expenditures were made to "paupers" and "widows" in 1930, while these had disappeared from the expense items of 1940. This was probably a result of the public welfare programs of the federal and state governments during this decade. This raises an unanswerable question as to what the extent of demands upon the revenues of the parish government would have been for such purposes in the depression years in the absence of federal government aid for welfare programs.

During the decade of 1940-1950, gas and oil were discovered in some parts of Lincoln Parish. Consequently, parish revenues for the year 1950 show a phenomenal increase in severance taxes, from \$1,543 in 1940 to \$34,603 in 1950. Although timber production was also on the increase, reflecting a beginning of the transition from row-crop farming to forestry in some areas, a legislative act of 1948 deprived the parishes of the timber severance tax. This act was subsequently repealed in 1954.

Income from the property tax was up to \$195,018, an increase of about 69 percent. Assessed value of property had increased considerably over the decade, largely as a result of the urbanization within the parish, particularly around the city of Ruston. Much of the upgrading resulted from the reclassification of agricultural land into country and city lots. The value of business assets was also increasing rapidly. An increase of four mills in the ad valorem tax rate was made in 1948 to provide a sinking fund for bonds issued to finance the construction of a new courthouse.

Income from fees and fines was about four times as large in 1950 as in 1940. The fund available for road maintenance and construction had increased from \$76,000 to \$141,000, primarily as a result of three changes: a \$30,000 appropriation from the state legislature which was begun on an annual basis in 1948, a doubling of income from the gasoline tax, and a \$21,000 increase in the ad valorem tax revenue for road purposes.

The police jury received \$3,000 in 1950 from interest on United States treasury bills that had been purchased during the war years, reflecting a change from a status of local debtor during the previous decade to one of creditor holding a sizable amount of United States government securities in 1950.

One reduction in revenue noted in 1950 was the chain store tax which had been available to the parish government in 1940, but had been dedicated by 1950 to municipalities by the legislature, although it remained a responsibility of the parish government to collect.

Total revenue of the Lincoln Parish Police Jury in 1950 amounted to \$322,053, more than twice the amount received 10 years earlier. The proportion of this furnished by the property tax was 60.5 percent or about 15 percent less than the share from this tax in 1940.

By 1960 total income received by the police jury amounted to \$870,881, an increase of about 170 percent over 1950. The share of the property tax going to the police jury increased by \$194,151. The severance tax had increased \$66,000, while fees and fines furnished almost three times as much revenue as they did in 1950. This was the second time in two decades that total general fund revenue had doubled.

Increased funds for road construction and maintenance resulted largely from an increase in gasoline tax revenues, an increase in ad valorem tax income and a small increase in state grants. Beginning in 1959, an additional ad valorem tax rate of four mills was levied for the construction of a hospital facility, adding about \$25,000 to revenue.



In the meantime, assessed value of taxable property had more than doubled because of the rapid residential development in the urban and suburban areas of the parish. These factors combined to give the large increase in property tax revenue during the period.

Income from the gasoline tax in 1960 was up by about 137 percent from 1950, with no increase in the tax rate, while the severance tax revenue had nearly tripled since 1950. In 1954, the legislature amended the severance tax law so as to return to the parish 75 percent of the tax collected on timber.

State grants for roads and elections were up by less than 1 percent. The chain store tax continued to be collected by the parish, but was dedicated to municipalities wherein the stores were located. The only source for which a reduction in revenue was noted during the 1950 decade was business licenses. This was partly because of the expansion of city limits which gave the revenue from business licenses in the affected area to the respective municipalities.

**Percent**

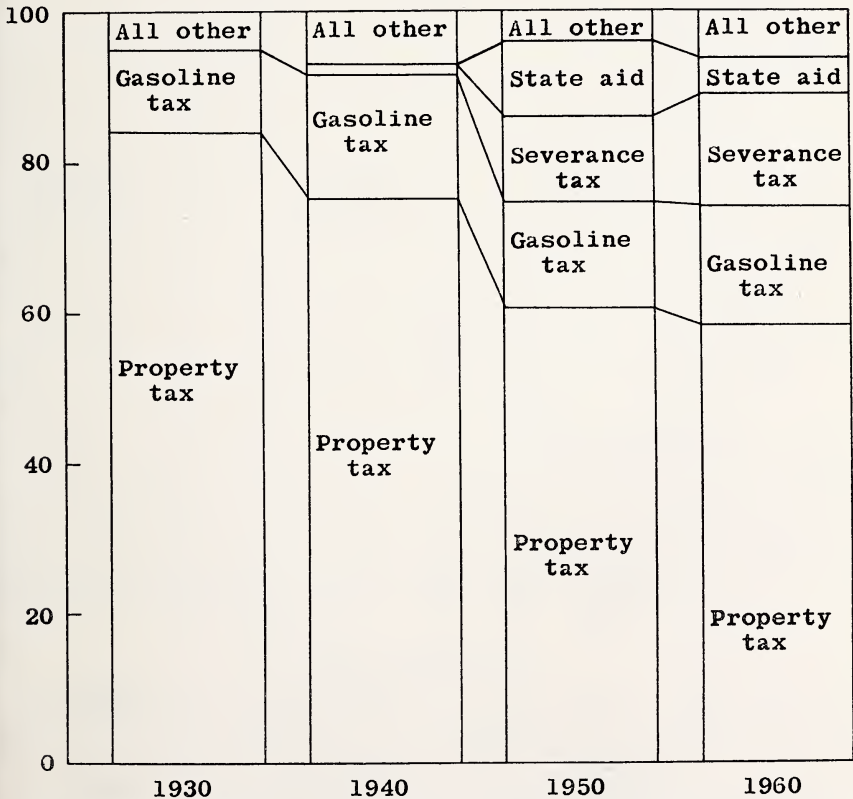


**FIGURE 2.—Relative importance of various sources of revenue to the Lincoln Parish Police Jury.**

The most significant changes in the revenue structure of the parish government over the 30 year period were: (1) an increase in ad valorem tax rates; (2) a huge increase in revenue from the consumption of gasoline through the gasoline tax; (3) increased allocations by the state legislature for the maintenance of a road system. (4) the discontinued borrowing from local banks in preference to the issuance of bonds secured by the general credit of the parish and sold in the open bond market, thus indicating a strengthening of the credit position of the

Percent

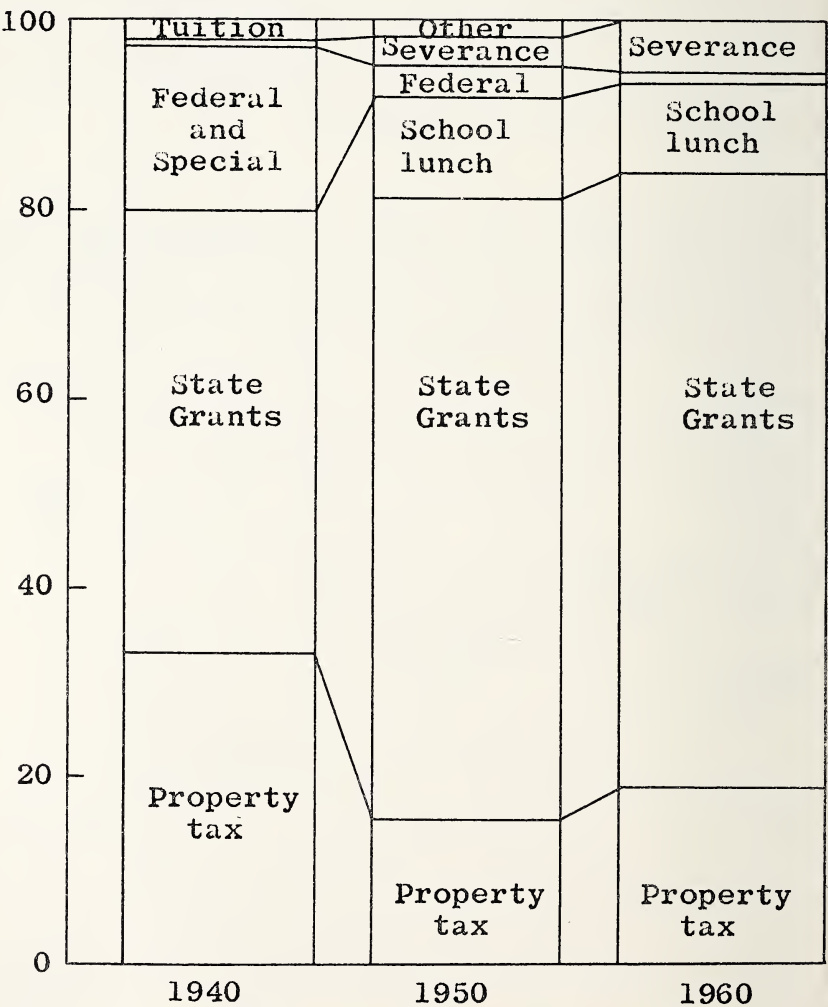


FIGURE 3.—Relative importance of various sources of revenue to the Lincoln Parish School Board.

local government after the depression years; (5) a decreasing percentage of total revenue represented by the property tax; and (6) sizable surpluses at the close of each year's fiscal operations in recent years in contrast to deficits in the 1930 decade. Trends in importance of various sources contributing to police jury revenues are indicated in Figure 2.

### **Parish School Board**

The earliest available data concerning revenue and expenditures of the Lincoln Parish School Board was for fiscal year 1940. Sources and volume of revenue for fiscal 1940, 1950, and 1960 are presented in Table 18. Observed changes in sources of revenue since 1940 include a decline in the relative importance of the local property tax, an increase in the relative importance of state grants-in-aid, and the addition of funds for the augmentation of a program of hot lunches served to school children without regard to financial need (Figure 3).

School board revenues derived from the local property tax increased by nearly four times between 1940 and 1960, but declined in its share of the total from one-third in 1940 to 19 percent in 1960. During the same period, state grants increased more than eight times and changed from 47 percent of total revenue to 65 percent. In 1940 federal and special grants comprised about 18 percent of total income but less than 2 percent in 1960. About seven eighths of the funds in this category in 1940 were those contributed by the Public Works Administration for building maintenance and construction costs in the Ruston School District. Severance taxes increased appreciably from 1940 onward; whereas they contributed nearly \$1,500 for school purposes in 1940, the contribution by 1960 was over \$126,000. As a percentage of the school budget, the change was from less than 1 percent to more than 5 percent.

Funds for the school lunch program increased about 50 percent from 1950 to 1960, but decreased about 1 percent as its share of total revenue. Funds were not provided in this category in 1940.

Total revenue available to the school board in 1960 was a little more than six times the amount available in 1940, and a little less than twice the amount in 1950. Most of the increase resulted from favorable consideration on the part of the state legislature in making additional funds available to the parish school system through the State Board of Education. A comparison of revenues and expenditures of the school board and police jury is shown in Figure 4.

### **Other Agencies**

Revenue sources for the offices of sheriff, clerk of court, and tax assessor of Lincoln Parish have not changed over the period of time studied. However, the state legislature has at times raised the amount to be charged for fees and commissions from which revenue is derived. Amount of services rendered has also increased. Consequently, the amount of revenue received, as well as expenditures, advanced by rela-

TABLE 18.—Revenue to the Lincoln Parish School Board, Fiscal Years 1940, 1950, and 1960, Showing Percent Obtained from each Source

| Source                     | 1940      |         | 1950        |         | 1960        |              |
|----------------------------|-----------|---------|-------------|---------|-------------|--------------|
|                            | Amount    | Percent | Amount      | Percent | Amount      | Percent      |
| State grants               | \$175,730 | 47.4    | \$ 887,508  | 67.0    | \$1,523,161 | 65.0         |
| Property tax               | 119,060   | 32.2    | 210,626     | 15.9    | 443,086     | 18.9         |
| Federal special grants     | 65,600    | 17.7    | 35,227      | 2.6     | 35,641      | 1.5          |
| Severance tax              | 1,482     | .4      | 31,438      | 2.4     | 126,301     | 5.4          |
| Tuition from other schools | 6,708     | 1.8     | 21,204      | 1.6     |             |              |
| School lunch fund          |           |         | 136,465     | 10.3    | 213,640     | 9.1          |
| Other                      | 1,562     | .4      | 2,004       | .2      | 470         | <sup>a</sup> |
| Total                      | \$370,142 | 100.0   | \$1,324,472 | 100.0   | \$2,342,299 | 100.0        |

<sup>a</sup>Less than .1 percent.



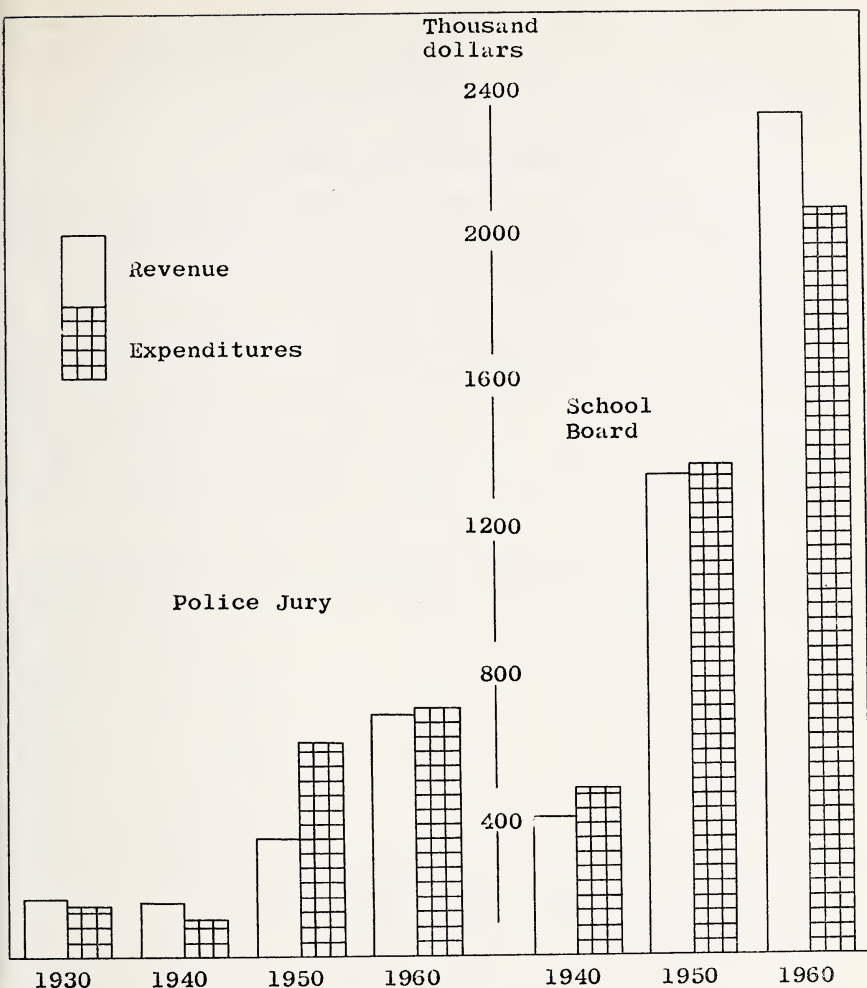


**FIGURE 4.—Revenue and expenditures of Lincoln Parish Police Jury and School Board, census years 1940-1960.**

tively large amounts each decade. These changes are shown in Table 19. Where expenditures exceed revenue in the years given, funds were available from surpluses built up in prior years. Only at the end of a term of office does the incumbent return the surplus to the police jury.

### Some Revenue Problems

The previous chapters have presented facts pertaining to sources of revenue and items of expenditure for Lincoln Parish.

The revenue sources are somewhat traditional. New sources, in keeping

with a changing economic structure in the parish, are very reluctantly instituted. Consequently, certain problems and implications in light of growing demands for future financing are becoming apparent. This chapter examines some of these areas of concern.

## Problem of Assessment

It has been shown that the general property tax now accounts for a little less than half of the revenue to the central parish government and about one-fifth of total school funds. Administration of this tax involves the evaluation and assessment of property by a locally elected tax assessor and the Louisiana Tax Commission. This process has been variously criticized as creating inequities in the tax burden among property owners. In a study of assessment-sales ratios in six North Louisiana parishes, including Lincoln, St. Clergy and Corty found among other inequalities that "properties with a sales value of \$2,000 were assessed at a ratio two and a half times as high as properties with sales value at \$8,000 or more."<sup>24</sup> In Lincoln Parish the ratio of assessment to sales

**TABLE 19.—Amount of Revenue and Expenditures of Offices of Sheriff, Clerk of Court, and Tax Assessor of Lincoln Parish, Louisiana, by Decades, 1930-1960<sup>1</sup>**

|                | 1930                  | 1940     | 1950     | 1960                |
|----------------|-----------------------|----------|----------|---------------------|
| Sheriff        |                       |          |          |                     |
| Revenue        | \$14,747 <sup>2</sup> | \$22,339 | \$32,038 | \$86,924            |
| Expenses       | 15,529                | 23,666   | 32,980   | 81,067              |
| Clerk of court |                       |          |          |                     |
| Revenue        |                       | 12,015   | 23,874   | 31,096              |
| Expenses       |                       | 11,474   | 21,128   | 34,450              |
| Tax assessor   |                       |          |          |                     |
| Revenue        | 6,000 <sup>2</sup>    |          | 14,500   | 22,300 <sup>3</sup> |
| Expenses       | 5,835                 |          | 13,472   | 27,507 <sup>3</sup> |

<sup>1</sup>Fiscal year, except assessor's account is based on calendar year.

<sup>2</sup>Carried in budget of police jury for calendar year 1930.

<sup>3</sup>Calendar year 1959.

value for 143 tracts ranged from less than 9 percent to more than 90 percent. While efforts are being made in some parishes of the state to improve assessments, it is expected that current low rates of assessment relative to market value will continue to exist in Lincoln Parish, in the absence of a state-wide campaign mutually agreed upon by the assessors and willfully supported by the electorate.

The constitution and laws of the state are very specific in spelling out the rules for assessment and valuation of property for tax purposes. Article 10, Section 1, of the constitution states that "no property shall be assessed for more than its actual cash value, ascertained as directed by law . . . ." Section 12 of Article 10 requires that "all real estate,

<sup>24</sup>St. Clergy, C. J. and Corty, F. L., *Assessment of Rural Properties in North Central Louisiana*, Louisiana Agricultural Experiment Station Bulletin No. 538, March 1961, p. 5.

exempt as well as taxable, shall be valued at actual cash value, listed on the assessment rolls, and submitted to the Louisiana Tax Commission."

The basic problem of assessment hinges on the relation of *actual cash value* to *actual assessed value* of property. The constitution is exacting in its requirements of valuation at actual cash value and assessment at no more than cash value. However, the determination of "actual cash value" of a unit of property is difficult. Title 47, Section 1702, Revised Statutes of 1950, defines actual cash value, as follows:

'Actual cash value', or 'actual cash valuation', means the valuation at which any real or personal property *is assessed for the purpose of taxation*, (author's emphasis) after the assessing authorities have considered every element of value in arriving at such evaluation.

According to this, the value which the assessor places on the piece of property comes to be the actual cash value for tax purposes. The same statute further states that the

price at which any piece of real estate or personal or movable property shall have been sold for cash in the ordinary course of business, free of all encumbrances, otherwise than at forced sale, *shall be evidentiary only*, and be considered with other factors in determining the actual cash value for assessment purposes.

Such legislative stipulations for determining values of property for tax purposes are of little aid to the assessor, since many factors can legally be considered. It is not mandatory that the price at which a unit of property was sold be used as the value for tax purposes; it is suggested as evidence only. It assumes that each piece of property has at some time been sold for cash by a willing seller to a willing buyer and that this price helps indicate the true value of the property. Following this method, the assessor knows the value for the year of sale but can only guess subsequent values until it is sold again.

Such procedure for determining value would be useful only in case of transfers in the immediate past. Most real estate in the parish has not been sold in many years, making it impossible to have a recent sale price for every tract. An alternative to this is the use of sample sales in the same vicinity as an indication of value of like pieces of property. This is provided for in Section 1958 of Title 47, Revised Statutes of 1950, which requires that:

The assessor shall also inquire into the purchase price paid for real property when acquired by the owner, and ascertain and acquaint himself with any sales or transfers of property of like description or value made or effected in the vicinity, within the year or years next preceding the listing for assessment then being made; and the price paid for property at such sales or transfers *shall be considered* by the assessors in determining the value of the real property to be listed for assessment.

The assessor, therefore, is not in violation of law when he values property for tax assessment purposes at less than market value. While it would be easy to use sale price as value for many new subdivisions and commercial tracts sold in recent years, this would mean a much higher

taxable value on them than on many equally valuable properties, which have not been transferred in several generations.

The parish assessor normally visits each piece of property when it is first placed on the assessment rolls. If it is residential, he looks at the size of the house and of the lot; then he estimates its value relative to the assessed value of other units in the same area. In the case of commercial real property, he considers its size and type in relations to other properties in the same vicinity.

The problem of equitable assessment is highlighted by the following data. A standard measure for judging whether equitable assessment values have been assigned is to examine the ratio of assessment to the sale price of the property concerned. By dividing the assessed value by the sale price, the "assessment ratio" is found. This ratio states the percent of actual sale value represented by the assessed value. A comparison of the assessment ratios among different types of property shows the degree of uniformity of assessments. A study of 143 properties sold in Lincoln

**TABLE 20.—The Proportion of 143 Rural Tracts of Land Sold in Lincoln Parish, Classified as to Rate of Assessment, 1953-1958**

| Rate of Assessment | Percent of Tracts |
|--------------------|-------------------|
| 0- 9 .....         | 16                |
| 10-19 .....        | 54                |
| 20-29 .....        | 15                |
| 30-39 .....        | 7                 |
| 40-49 .....        | 3                 |
| 50-59 .....        | 3                 |
| 60-69 .....        | 0                 |
| 70-79 .....        | 1                 |
| 80-89 .....        | 0                 |
| 90-Over .....      | 1                 |
| Total .....        | 100               |

Source: St. Clergy, C. and Corty, F. L., *Assessment of Rural Properties in North Central Louisiana*, Agricultural Experiment Station Bulletin No. 538, Louisiana State University, Baton Rouge, Louisiana, March 1961, Table 2.

**TABLE 21.—Weighted Average Rate of Assessment as Related to Property Values, 143 Rural Tracts, Lincoln Parish, 1953-1958**

| Sale Value Per Property<br>(Dollars) | Rate of Assessment<br>(Percent of Sale Value) |
|--------------------------------------|-----------------------------------------------|
| Under-2,000 .....                    | 27                                            |
| 2,000-3,999 .....                    | 16                                            |
| 4,000-5,999 .....                    | 16                                            |
| 6,000-7,999 .....                    | 14                                            |
| 8,000-Over .....                     | 12                                            |

Source: St. Clergy, C. and Corty, F. L., *Assessment of Rural Properties in North Central Louisiana*, Agricultural Experiment Station Bulletin No. 538, Louisiana State University, Baton Rouge, Louisiana, March 1961, Table 3.



Parish from 1953 to 1958 revealed a wide variation in assessment ratios within the parish (Tables 20 and 21).

The Public Affairs Research Council of Louisiana, in a 1958 state-wide study of assessment ratios for individual parishes including Lincoln Parish, reported an average assessment ratio for 114 properties as 16.9 percent.<sup>25</sup> Urban improved residential parcels averaged 20.1 percent, compared with 10.3 percent for urban unimproved residential and 9.3 percent for woodland tracts. A comparison of the average ratio for Lincoln Parish with that of other parishes in the state is presented in Table 22.

## Problem of Exemptions

Another serious problem affecting local revenue is that of exemptions from the ad valorem property tax. Two significant types of exemptions exist in Louisiana: homesteads, and exemptions for new or expanding industries. In addition to these, certain specific pieces of property are exempted for all taxpayers. Article 10 of the constitution and Section 1703 of Revised Statutes of 1950 are the authority for exemptions.

### Homestead Exemptions

In 1936, the homestead exemption amendment was added to the constitution and further amended in 1938. The first \$2,000 of assessed value of each home, rural and urban, is exempt from property taxes provided the owner resides on the property. For veterans of World War II, the exemption is \$5,000 for ten years ending in 1964; for veterans of World War II plus Korean War, the exemption is \$5,000 for ten years ending in 1969. This includes all land adjoining the land where the residence is located, and separate tracts used for a field, pasture, or garden.

At the time of adoption of the homestead amendment assessed values of most homes, especially in rural areas, were such that the \$2,000 exemption was sufficiently high to excuse most property owners from paying any property taxes. Ordinarily this would deprive the local government of a major source of income. To remedy this, the legislature provided for a "property tax relief fund" from which the state would pay the parishes the amount of taxes lost each year through homestead exemptions. The property tax relief fund is supplied by (1) the state income tax, (2) the alcoholic beverage tax, and (3) the public utilities tax, in that order. The amount of exemptions cannot exceed the amount available in the relief fund each year.

In Lincoln Parish, from 25 to 30 percent of the total ad valorem taxes due each year are paid from the property tax relief fund. In 1960, this proportion was 26.5 percent (Table 23). When only the taxes due from locally assessed real estate (excluding tax commission assessments such as public utilities) are considered, the percentage paid from the fund approximates 55 percent each year.

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<sup>25</sup>Public Affairs Research Council of Louisiana, Inc., *Louisiana Property Tax*, Volume II, Baton Rouge, Louisiana, October 1960, p. 122.

TABLE 22.—Parish Average Assessment Ratios

| Parish               | Ratio | Parish           | Ratio |
|----------------------|-------|------------------|-------|
| Caddo                | 31.5% | Webster          | 16.4% |
| Orleans (District 1) | 28.0  | St. James        | 16.1  |
| Orleans (District 3) | 25.9  | Pointe Coupee    | 15.9  |
| Orleans (District 7) | 25.5  | Acadia           | 15.5  |
| Orleans (District 6) | 24.7  | Red River        | 15.5  |
| East Carroll         | 24.5  | West Baton Rouge | 15.5  |
| Orleans (District 2) | 24.5  | Franklin         | 15.4  |
| Assumption           | 23.5  | St. Bernard      | 15.4  |
| St. Mary             | 23.5  | DeSoto           | 15.0  |
| Iberia               | 23.1  | Union            | 14.8  |
| Orleans (District 4) | 22.3  | St. Tammany      | 14.6  |
| Richland             | 22.3  | Calcasieu        | 14.5  |
| Tensas               | 22.0  | Ascension        | 14.4  |
| West Carroll         | 21.5  | Washington       | 14.1  |
| Orleans (District 5) | 20.7  | Winn             | 13.8  |
| Iberville            | 20.6  | Beauregard       | 13.2  |
| Madison              | 20.2  | Livingston       | 13.1  |
| St. Landry           | 20.2  | Jackson          | 12.8  |
| Grant                | 20.1  | Lafourche        | 12.5  |
| West Feliciana       | 20.1  | St. Charles      | 12.0  |
| Bienville            | 19.6  | Sabine           | 11.5  |
| Natchitoches         | 18.9  | Vermilion        | 11.3  |
| Ouachita             | 18.9  | Concordia        | 10.9  |
| Bossier              | 18.8  | Tangipahoa       | 10.8  |
| St. John             | 18.1  | Jefferson Davis  | 10.7  |
| Morehouse            | 18.0  | Rapides          | 10.7  |
| Avoyelles            | 17.8  | St. Martin       | 10.2  |
| Catahoula            | 17.5  | East Feliciana   | 10.1  |
| East Baton Rouge     | 17.1  | Jefferson        | 9.8   |
| Plaquemines          | 17.1  | Evangeline       | 9.3   |
| Claiborne            | 16.9  | Terrebonne       | 8.7   |
| Lincoln              | 16.9  | Allen            | 8.3   |
| Vernon               | 16.6  | St. Helena       | 8.2   |
| Caldwell             | 16.5  | Cameron          | 7.2   |
| LaSalle              | 16.5  | Lafayette        | 7.1   |
| Median               | 16.5  |                  |       |

Source: Public Affairs Research Council of Louisiana, Inc., *Louisiana Property Tax Summary and Recommendations*, Baton Rouge, Louisiana, October 1960, page 7.

While the homestead exemption does not reduce parish revenues, it does shift a big portion of the burden to citizens all over Louisiana who pay the above-listed taxes, chiefly the income tax. Many property owners in the parish have their entire ad valorem tax burden paid from this source, while they receive the benefit of the expenditures. The number of taxpayers in Lincoln Parish in 1959 was 8,612, of which 4,359 had homestead exemptions, either on part of assessed value, or on the total amount of it.

Another effect of the homestead exemption is that it allows residents to vote taxes which they can shift to others, especially to public utilities and commercial interests. Homeowners can count their entire

assessment for voting in property tax elections, although all or a part of it is under homestead exemption. In a recent school bond election, one of the important points which the proponents expressed in favor of the tax raise was the fact that over 25 percent of the increased tax would be covered by homestead exemptions, while about 30 percent would be paid by public utilities, leaving only 45 percent to be paid by the voters. The bond issue carried by a large majority.

### Industrial Exemptions

These are authorized by Article 10, Section 4, paragraph 10 of the state constitution. This section permits the State Board of Commerce and Industry to enter into an agreement with the owners of any new manufacturing firm making additions to its plant whereby for a period of five years the firm shall be exempt from all property taxes. The contract may be renewed for another five years, a maximum of ten years from date of original contract.

Under this exemption local governments lose a significant amount of property taxes. This amount is not refunded to the local governments from state funds. In 1960, 11.3 percent of the assessed value of all property in Lincoln Parish was owned by manufacturing firms enjoying the benefits of tax exemptions under a 10 year contract with the state. If these plants had paid taxes at the rate levied in 1960, the parish would have received \$141,114 more in revenue for schools, roads, and other functions.

The purpose of the industrial plant exemption plan is to induce industry to locate in Louisiana in preference to other states. This appears to be a valid inducement. However, as all states begin to grant

**TABLE 23.—Assessed Value of All Property, Lincoln Parish, 1960**

| Kind of Property                                      | Assessed Value      | Percent of Total Assessed Value |
|-------------------------------------------------------|---------------------|---------------------------------|
| <b>Taxable:</b>                                       |                     |                                 |
| Personal: Mercantile                                  | \$ 6,891,380        | 23.4                            |
| Public utilities                                      | 5,692,310           | 19.0                            |
| Other real estate                                     | 9,778,270           | 33.2                            |
| Total taxable                                         | \$22,271,960        | 75.6                            |
| <b>Non-taxable, legally exempt:</b>                   |                     |                                 |
| Manufacturing plants, under 10-year contract          | 2,505,222           | 8.5                             |
| Other: public, church etc.                            | 4,677,200           | 15.9                            |
| Total non-taxable                                     | 7,182,422           | 24.4                            |
| <b>Total assessed value</b>                           | <b>\$29,454,382</b> | <b>100.0</b>                    |
| Number of taxpayers                                   |                     | 9,127                           |
| Number of homestead exemptions                        |                     | 4,963                           |
| Value of homestead exemptions                         |                     | \$5,914,640.00                  |
| Amount of taxes paid by state on homestead exemptions |                     | \$ 284,341.63                   |
| Amount of taxes paid directly by taxpayers            |                     | \$ 789,446.20                   |
| <b>Total taxes paid</b>                               |                     | <b>\$1,073,787.83</b>           |

similar special tax privileges this inducement loses its force. Other plans have to be introduced, such as the offering of plant facilities either free or on a credit purchase basis, in addition to the tax exemption. The community or state is not encouraged to abandon this tax exemption privilege, however, in spite of the conformity of neighboring areas, because to do so would immediately put the community at a tax disadvantage. Thus, a situation has developed which results in loss of revenue to the parish, with no particular inducement provided for new industries.

### Other Exemptions

Section 4 of Article 10 of the constitution lists a number of other items which are exempt from taxation. These include all public property; the property of religious, charitable, and educational institutions; monies and credits; agricultural products; all cattle, livestock, and poultry; farm implements up to a value of \$500; one wagon per taxpayer; all motor vehicles (except for municipalities); boats using gasoline as motor fuel; bridges built under federal government loan; property of electric cooperatives for 25 years; and all household furniture and musical instruments.

If all property exemptions constitutionally provided had been cancelled in 1960, Lincoln Parish would have received approximately \$542,395 more in tax revenue (Table 24). This does not take into account the exemption of two mills of parish taxes for residents of Ruston, nor does it consider the static value of forest lands resulting from the forestry taxation laws.

### Effect of Change in Land Classification

Land use in Lincoln Parish has changed considerably over the past 30 years. Until about World War II the parish was predominantly agricultural, with row crop farming dominating the scene. The decline of agriculture since that time is in direct contrast to the growth of industry, forestry, and urban development. The percent of land area in farms

**TABLE 24.—Additional Revenue that Could Be Made Available to Lincoln Parish, if Property Exemptions Were Cancelled (Based on Assessed Value and Tax Rate for 1959)**

| Type of Exemption                              | Assessed Value         | Tax Rate | Potential Revenue |
|------------------------------------------------|------------------------|----------|-------------------|
|                                                | (Dollars)              | (Mills)  | (Dollars)         |
| Manufacturing plants                           | 4,033,565              | 41.5     | 167,393           |
| Public and church                              | 4,677,200              | 41.5     | 194,104           |
| Autos and other personal property <sup>1</sup> | 4,359,000 <sup>2</sup> | 41.5     | 180,898           |
| Total                                          | 13,069,765             |          | 542,395           |

<sup>1</sup>See Table 23.

<sup>2</sup>Value estimated by the author by assigning \$1,000 worth of autos, furniture, and other personal effects to each of 4,359 property owners who claimed homestead exemptions in 1959. This is probably a lower value than would prevail if the property were counted and listed on the assessment rolls.



declined from a peak of 83 percent in 1940 to 39 percent in 1960 (Table 25). Number of farms declined from about 3,000 in the decade prior to World War II to a low of 835 in 1960, with less than half as many acres in farms as in 1930 and 1940. Acres of cropland harvested in 1960 were about one-twelfth that of 1940. What effect has this decline of agriculture had on revenue to the parish from the property tax?

Assessment regulations require that lands for agricultural use be classified for valuation purposes into Class A, Class B, and Class C lands. Class A is the best and most valuable land, Class B is next best, and Class C is the poorest quality agricultural land. This classification is for all of the land in the parish rather than for a particular taxpayer's land. Each taxpayer may have one or more classes.

Assessment values are highest for Class A and lowest for Class C land. For example, in 1945 Lincoln Parish had 7,555 acres of Class A land valued for assessment at \$15.12 per acre, 28,814 acres of Class B land valued at \$10.90 per acre, and 56,859 acres of Class C land valued at \$8.43 per acre.

Many of the farms abandoned or converted to forestry use after World War II were reclassified for assessment purposes. Idle land was usually classified as miscellaneous or pasture land at a reduced price per acre. As properties sold, they were reassessed at a value ranging from 10 to 20 percent of selling price. When other lands were turned into timber production, they were eligible for classification as forest lands and subject to a lower assessed value per acre. As some of the farms near towns became urbanized, they were reassessed as country-lot or city-lot rates, which increased the assessed value (Revised Statutes 47:1958) of the land formerly assessed as a farm. Added improvements helped increase the assessments still further. As city limits expanded to encompass more land area, assessed values increased again.

These changes in land use, particularly the rapid expansion of urban and suburban areas, in Lincoln Parish have resulted in a total increase of assessment values for the parish (Table 26). Even if the millage

**TABLE 25.—Population and Farm Land Statistics, Lincoln Parish, Louisiana, by Decades, 1930-1960<sup>1</sup>**

|                           | 1930                 | 1940      | 1950      | 1960       |
|---------------------------|----------------------|-----------|-----------|------------|
| Population, number        | 22,822               | 24,790    | 25,782    | 28,535     |
| Land area, acres          | 302,080 <sup>2</sup> | 300,160   | 300,160   | 300,160    |
| Percent in farms          | 81.2                 | 82.8      | 62.9      | 39.4       |
| Acres in farms            | 245,269              | 248,598   | 188,656   | 118,261    |
| Number of farms           | 3,396                | 2,842     | 1,949     | 835        |
| Cropland harvested, acres | 93,664               | 88,699    | 30,741    | 7,398      |
| Value of farms:           |                      |           |           |            |
| Total, dollars            | 7,690,365            | 5,226,445 | 9,589,080 | 14,017,980 |
| Per farm, dollars         | 2,265                | 1,839     | 4,920     | 16,788     |

<sup>1</sup>Data on land and farms from U. S. agricultural censuses of preceding year.

<sup>2</sup>Larger than for succeeding decades because of adjustments made by a resurvey conducted just prior to the 1940 census.

**TABLE 26.—Assessed Values of Selected Types of Property and Total Property Taxes Levied in Lincoln Parish, Louisiana, 1930, 1944, 1950 and 1958**

| Class of Property   | 1930       | 1944       | 1950       | 1958       |
|---------------------|------------|------------|------------|------------|
|                     | Dollars    | Dollars    | Dollars    | Dollars    |
| Agricultural lands: |            |            |            |            |
| Class A             | 188,130    | 115,290    | 112,300    | 94,030     |
| Class B             | 407,500    | 306,650    | 318,820    | 286,800    |
| Class C             | 464,210    | 478,630    | 481,430    | 477,170    |
| Pasture lands       | 259,900    | 226,470    | 247,990    | 242,100    |
| Suburban lands      | 109,050    | 47,230     | 41,060     | 26,590     |
| Forest lands:       |            |            |            |            |
| Cutover pine        | 0          | 19,130     | 29,760     | 37,690     |
| Cutover cypress     | 0          | 0          | 5,210      | 5,740      |
| Reforestation       | a          | 0          | 0          | 1,360      |
| Woodland            | 785,150    | 595,350    | 551,900    | b          |
| Miscellaneous lands | 0          | 1,270      | 4,210      | 549,630    |
| Country lots        | 51,300     | 53,890     | 160,250    | 179,220    |
| Improvements        | a          | 211,730    | 552,670    | 993,700    |
| City lots           | 770,750    | 753,370    | 1,013,350  | 1,294,250  |
| Improvements        | 1,532,430  | 1,578,980  | 2,745,090  | 4,482,530  |
| Public Service      |            |            |            |            |
| Corporations        | 1,850,229  | 2,391,739  | 4,086,708  | 5,320,900  |
| All other property  | 3,004,670  | 1,104,022  | 2,687,999  | 7,280,500  |
| Total Assessment    | 9,423,319  | 7,883,751  | 13,038,747 | 21,272,210 |
| Index of Change:    | 1930=100   | 83.7       | 138.4      | 225.7      |
| Taxes levied:       |            |            |            |            |
| Local               | 303,680.20 | 248,638.17 | 480,026.05 | 722,869.82 |
| State               | 54,184.23  | 45,331.56  | 74,975.56  | 104,202.84 |
| Total               | 357,864.43 | 293,969.73 | 555,001.61 | 827,072.66 |
| Index of Change:    | 1930=100   | 82.1       | 155.1      | 231.1      |

<sup>a</sup>No classification by the tax commission.

<sup>b</sup>Classification discontinued, now included as miscellaneous land.

rate had remained constant, then, parish revenues from the property tax would have shown a total increase. By increasing the tax rate, revenue was even further increased. Table 26 shows the change in total assessment and in taxes levied in the parish over selected years.

### Effect of Change in Age Composition of Population

The population of Lincoln Parish increased by 2,753, or about 11 percent during the 1950-60 decade, compared with an increase of 21 percent for Louisiana. Age groups contributing to this increase were those of 5 to 24 years and 45 or more years. Persons 85 years and over increased from 51 to 175. Those under 21 years increased by about 2,000 persons. Decreases were observed in the ages under 5 years and 25 to 44 years. What effect will these changes have on revenue needs in the future?

While the parish as a whole increased by 2,753 persons, the city of Ruston alone showed an increase of 3,619 persons, thus accounting for most, if not all, of the parish growth. The larger figure is explained by the expansion of city boundaries during the decade. All wards except Ward 1, in which Ruston is located, showed a decrease from 1950 to 1960. Analysis of the functions of the central parish government reveals that little, if any, change in the revenue-expenditure composition of the police jury will result from the changing population because its major item of expense has been road construction.

The increase in the population in the older age groups could conceivably create a need for expanded hospitalization facilities. Since the parish embarked on a hospital construction program just prior to this study, such revenue and costs have been included in the computation of present needs. No expanded costs for this program are anticipated during the next decade, because it is now in the process of leasing the facilities to a separate hospital administration which will support the operation of the hospital from its own revenues.

More aging persons surely will mean a greater need for so-called "welfare" benefits in the future. However, it is not likely that this program will ever again be assumed by the parish government, but will continue to be supported by the state and federal governments.

The 19 to 24 age group will undoubtedly lead to some family formations and an increase in home ownership during the next decade which could augment property tax revenue to the parish government. The growing families will likely make demands on the local government for new services, such as a public library, more recreation facilities, and civil defense activities, which have not been included as a public service in prior years. In fact, at this writing, the police jury is preparing for the first time to place in its budget an expenditure item for salaries and office facilities for a parish civil defense director on a permanent basis.

The increase in the age group of 5 to 19 years will have an impact on revenue needs of the parish school board. More teachers will be necessary during the next decade. If present trends continue, parish property owners can expect increased demands for property tax revenues with which to support new school construction and expansion of existing plants. As long as the number of school-age youths grows, even with consolidation of schools, new construction will be necessary. If the state legislature should ever reduce its contributions to the parish school system, there will be further need for additional local taxes for the school board. This, however, is not anticipated by the authors. Rather, an increase in state grants to the parish for teachers' compensation and other costs is predicted, thus keeping the amount of local financial support for parish schools at a relatively low percentage about equal to that which now prevails.

## Conclusions and Implications

Total revenues expended for governmental functions in Lincoln Parish amounted to slightly more than \$3 million (excluding \$1.5 million for public welfare) in 1959 compared with \$559,000 in 1940. The big increase in revenues occurred in the form of state grants, and these were primarily for the parish school system. For example, the Lincoln Parish School Board received \$175,730 from the state in 1940 and by 1960 this amount had jumped to \$1,523,161, an increase of 767 percent. The total parish revenues increased by more than 400 percent during the same 20-year span.

Assuming about a 200 percent increase in the next 20 years, parish revenue needs would approach \$9 million in 1980. It is not likely that property taxes will increase accordingly. Instead, one might expect increasing dependency on state grants-in-aid and the introduction of local sales taxes or other new sources of revenue.

Regarding the use of a local sales tax, the parish government could easily raise nearly 50 percent of the amount of revenue received in 1959 by a tax at the 1 percent level.

According to its annual "Survey of Buying Power," *Sales Management* estimates total retail sales for 1960 in Lincoln Parish at \$26,096,000.<sup>26</sup> Exempting the sales of \$3,078,000 for gasoline stations (to allow for reduction of a sales tax where the gas tax already applies), \$23,018,000 retail sales are given. Applying a one percent sales tax to this, the parish would receive \$230,180 for one year, an amount equal to about 40 percent of the revenue received from all sources combined in 1959, and equal to nine-tenths of the revenue yield of the property tax for police jury functions.

Although sources of revenue remained the same over the past 20 years, their relative importance in terms of contributions to parish government changed appreciably. Property taxes contributed 45 percent of the public funds in 1940 but only 26 percent in 1960. On the other hand, state and federal aid accounted for 43 percent of the funds in 1940 and 61 percent in 1960. Severance tax revenues in 1940 were relatively insignificant, less than 1 percent, but with oil and gas development and increased harvest of forest products they accounted for about 7 percent of the total revenues in 1960.

Although gasoline tax revenues have more than quadrupled in 20 years, their relative importance has dropped from 5 percent to 3 percent. In like manner, proceeds from fees, fines, licenses, etc., doubled during the period 1940 to 1960, but their importance decreased from 6 to 2 percent.

Disregarding the parish \$1.5 million public welfare program, which is administered entirely by the state, Lincoln Parish relies upon the state for almost two-thirds of the financial support required for other

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<sup>26</sup>Reddock, James W., Louisiana Buying Power, *Louisiana Business Review*, July 1961, Vol. 25, Number 7, p. 20.



public functions. Only 20 years earlier the state and federal aid amounted to only 43 percent.

Apparently changes in land use, resulting from change of cropland to pasture or forestry, have not reduced the total revenues derived from property taxes. Some reclassification and downgrading for assessment has taken place and, although ad valorem tax rates have increased slightly, the increased revenues from property taxes may be more aptly explained by the development of new suburban properties whose increasing values more than offset the losses resulting from downgrading the cropland. As farming continues to give way to forestry, the rural property tax base will diminish and more and more reliance will be placed upon outside help. In this respect, the homestead exemption deserves a brief comment.

In Lincoln Parish, about 55 percent of the locally assessed property taxes due each year are paid from the state's property tax relief fund because of the homestead exemption. Although, the homestead exemption does not reduce the tax revenues available to the parish, it does shift a great share of the tax burden to citizens throughout the state.

Another result of the homestead exemption is that it encourages residents to vote more liberally for higher tax rates since by virtue of the exemption they will generally be spared any increase in taxes and the increased burden is shifted to the state property tax relief fund.

Population trends in the parish point to an increase in the school age groups (5 to 19 years) and in the older age groups. Thus it is expected that added revenues will be needed for school purposes and for old age assistance. Those two areas have traditionally been supported by state and federal funds, and increasing assistance from these sources will undoubtedly be necessary.

Public revenues for Lincoln Parish have been more than adequate over the past few years, as evidenced by the sizeable surplus funds carried by the various governmental agencies from one year to the next. The police jury has been able to set aside a reserve almost sufficient to cover one year's needs. The offices of tax assessor, sheriff, and clerk of court have also accumulated substantial surpluses and these funds can be used for maintenance and improvement of these offices. Remaining surpluses are to be turned over to the police jury only at end of the term of office of the incumbent.

If greater autonomy in fiscal matters is desired by local government, it is suggested that local citizens assume greater financial responsibility for roads, schools, and public welfare. These are the three areas requiring most outside aid.

State assistance for roads can be justified on the grounds that highways provide means of communication and trade for nonresidents of the parish as well as for residents. Likewise, schools provide a means for educating young people who will eventually associate and compete with workers trained in other areas.

State and federal aid for welfare purposes is much more difficult

to justify. Local communities would be in a better position to evaluate personal needs of the indigent, aged, and infirm, and should assume responsibility for their welfare, in the event that family or relatives neglect to do so.

Some suggested procedures for increasing local financial responsibility are:

1. Bring assessment values of property more in line with true market values, assuming that other parishes will do likewise.
2. Make certain that all taxable property is on the assessment rolls.
3. Look more critically at certain tax exemptions.
4. Consider use of a locally administered sales tax in lieu of the state sales tax.
5. Reduce the high cost of tax collections.
6. Use the parish treasurer for central control of parish funds instead of maintaining separate control of funds by each agency of parish government.
7. More efficient use of space and labor can be realized through microfilming and machine records in the offices of assessor and clerk of court.

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# Louisiana's human resources

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Agribusiness and the Labor Force

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CHARLES W. UPP, DIRECTOR

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# Louisiana's Human Resources

## Part II: Agribusiness and The Labor Force

LEE TAYLOR AND ARTHUR R. JONES\*

Occupation is one of the most important factors in the life of any individual.

More than anything else, perhaps, a man's occupation determines his course and his contribution in life. And when life's span is ended, quite likely there is no other single set of facts that will tell so well the kind of man he was and the part he played in life as will a detailed and chronological statement of the occupation, or occupations, he pursued. Indeed, there is no other single characteristic that tells so much about a man and his status—social, intellectual, and economic—as does his occupation. A man's occupation not only tells, for every workday, what he does during one-half of his waking hours, but it indicates, with some degree of accuracy, his manner of life during the other half—the kind of associates he will have, the kind of clothes he will wear, the kind of house he will live in, and even, to some extent, the kind of food he will eat. And, usually, it indicates, in some degree, the cultural level of his family.

In similar manner there probably is no single set of closely related facts that tell so much about a nation as do detailed statistics of the occupations of its workers. The occupations of a people influence directly their lives, their customs, their institutions—indeed, their very numbers. In fact, the social and the economic status of a people is largely determined by the social and economic status of its gainful workers. And, were the figures available, the social and industrial history of a people might be traced more accurately through detailed statistics of the occupations of its gainful workers than through records of its wars, its territorial conquests, and its political struggles.

With present-day interest in social problems and in their statistical measurement, it has become quite evident that statistics which show the actual life conditions of 40 percent of the population for one-third of each work-day, and which give at least a rough index of their life conditions for the balance of the time—as well as giving a rough index of the life conditions of those dependent upon them—are far too important to be neglected.<sup>1</sup>

Similarly, to know the characteristics of Louisiana's labor force is to know a great deal about the people of the state. The availability of such information is important to industrial planners, personnel managers, sales distributors, educational officials, and government leaders.

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\* Assistant Professor of Rural Sociology and Graduate Assistant in Rural Sociology, respectively.

Occupational trends are also important to individuals who approach the age of choosing a job, individuals in the process of changing jobs, and occupational counselors. Occupational aspiration and job choosing has been particularly critical for rural youth in recent decades. Farming opportunities have declined.<sup>2</sup> Agribusiness employment opportunities, on the other hand, remain numerous.<sup>3</sup> But the occupational image of agriculture is low, and the opportunities in agribusiness are as yet little known. Consequently, most rural youths prefer to enter non-rural occupations.<sup>4</sup>

Career choice in modern urbanized society is one of the most important considerations of an individual's life. Yet finding one's place in the labor force is among the least systematized aspects of contemporary society. Occupational choice is at once opportunity, excitement, frustration, and too often, delusion. Americans change their jobs often; about once in five years, on the average. Job changing is an index of democracy and freedom; of open class and sensate society. It is also an indication of deficient recruitment processes and deficient occupational counseling. Freedom to choose and to change jobs is nobly American. But as occupational decisions are made at earlier ages, freedom to choose is reduced. Many jobs require long courses of training without which entrance is prohibited. Often, therefore, the maximum shifting of jobs is as much a fiction of freedom as a fact of inadequate or non-existent occupational counseling. Louisiana's great human resource can be more individually rewarded, and the state accomplish more, if the structure of occupational opportunities is widely communicated. This is particularly true for the many rural youths, where a more dramatic occupational shift from the parental generation will be required than for most urban youth.

## Louisiana Labor Force

According to the 1960 census the state's labor force numbered 1,092,385. It constituted 33.5 per cent of the 3,257,264 persons in the

**TABLE 1.—Labor Force as a Proportion of the Total Population of Louisiana and the United States, 1940-1960**

| Year | Louisiana* |             |          | United States** |             |          |
|------|------------|-------------|----------|-----------------|-------------|----------|
|      | Population | Labor Force | Per Cent | Population      | Labor Force | Per Cent |
| 1940 | 2,363,880  | 884,164     | 37.4     | 131,669,000**   | 56,030,000  | 42.5     |
| 1950 | 2,683,516  | 928,626     | 34.6     | 150,697,000**   | 64,599,000  | 42.7     |
| 1960 | 3,257,022  | 1,092,385   | 33.5     | 178,464,000*    | 73,126,000  | 41.0     |

\*Source: U.S. Bureau of the Census. *U.S. Census of Population: 1960. General Social and Economic Characteristics, Louisiana*. Final Report PC (1) -20C. U.S. Government Printing Office, Washington, D.C., 1961, p. 127; and *Number of Inhabitants, United States Summary*. Final Report PC (1) -1A. U.S. Government Printing Office, Washington, D.C., 1961, pp. 1-3 conterminous.

\*\*Source: Donald J. Bogue, *The Population of the United States*. (Glencoe, Illinois: The Free Press, 1959) p. 423.

state. (See Table 1.) In 1940 Louisiana had 884,164 persons in its labor force and by 1950 the total reached 928,626. The proportion of the state's population in the labor force was 37.4 and 34.6 per cent respectively for these earlier decades. Louisiana's labor force is a relatively stable proportion of its total population, ranging between 33 and 37 per cent over several decades. The national labor force has remained approximately 40 per cent of the total population since 1940, or a slightly larger proportion than that of the state.

The white labor force of Louisiana has increased from 546,160 in 1940 to 635,786 in 1950 and to 774,761 in 1960. For those years the white proportion of the labor force was 61.8 per cent, 68.5 per cent, and 70.9 per cent respectively. The nonwhite labor force totaled 338,004 in 1940, 292,840 in 1950, and 317,624 in 1960. The respective proportions were 38.2 per cent, 31.5 per cent, and 29.1 per cent. There is a clear pattern of increasing whites and decreasing nonwhites in the state's labor force.

Women have become a larger proportion of Louisiana's labor force. In 1940, it was reported that 209,606 women were in the labor force. By 1950 the number of women workers had increased to 238,554, and by 1960 they totaled 335,975. Their proportion of the labor force was 23.7 per cent in 1940, 25.7 per cent in 1950 and 30.8 per cent in 1960. Men experienced a slight increase from 674,558 in 1940 to 690,072 in 1950, and to 756,410 in 1960. As a proportion of the labor force, however, males declined from 76.3 per cent in 1940 to 74.3 per cent in 1950, and to 69.2 per cent in 1960.

In addition to viewing the labor force as a proportion of the total population it is also necessary to study it as a proportion of the population age 14 and over. Social structures make it nearly impossible for an individual to participate regularly in the labor force prior to age 14 and undesirable before age 18.

In Louisiana there were some 2,164,411 individuals age 14 and over in 1960. (See Table 2.) Fifty-one per cent of the population age 14 and over were reported in the labor force in 1960, 49 per cent in 1950, and 52 per cent in 1940.

**TABLE 2.—Labor Force as a Proportion of the Population Age 14 and over in Louisiana and the United States, 1940-1960**

| Year | Louisiana                 |                |             | United States             |                |             |
|------|---------------------------|----------------|-------------|---------------------------|----------------|-------------|
|      | Population<br>14 and Over | Labor<br>Force | Per<br>Cent | Population<br>14 and Over | Labor<br>Force | Per<br>Cent |
| 1940 | 1,710,446                 | 884,164        | 51.7        | 100,380,000               | 56,030,000     | 56.0        |
| 1950 | 1,882,568                 | 928,626        | 49.3        | 110,929,000               | 64,749,000     | 58.4        |
| 1960 | 2,164,411                 | 1,092,385      | 50.5        | 125,368,000               | 73,126,000     | 58.3        |

Source: U.S. Bureau of the Census. *U.S. Census of Population: 1960. General Social and Economic Characteristics, Louisiana*. Final Report PC(1)-20C. U.S. Government Printing Office, Washington, D.C., 1961, p. 127, and *Employment and Earnings*, 8 (October, 1961), Table A-1, p. 11.

## Geographic Distribution of the Labor Force

Louisiana's labor force is concentrated in the areas of the state's major cities.<sup>5</sup> (See Figure 1 and Table 3.) Parishes with the most people in the labor force were Orleans, 240,000; Caddo, 85,000; East Baton Rouge, 84,000; Jefferson, 73,000; Calcasieu, 51,000; Rapides, 37,000; Ouachita, 36,000; Lafayette, 30,000; St. Landry, 23,000; and Bossier, 21,000. All other parishes had fewer than 20,000 persons in the labor force in 1960. The greater concentrations of nonwhites in the labor force were found in the parishes of East Carroll, Madison, Tensas, East Feliciana, St. Helena, St. John the Baptist, St. James, West Feliciana, West Baton Rouge, Pointe Coupee, DeSoto, and Red River. More than 30 per cent of the labor force in each of these parishes was reported to be nonwhite.

Two general patterns appeared concerning the geographic location of women in the labor force. First, in most of those parishes with a major city the proportion of women in the labor force was 40 per cent

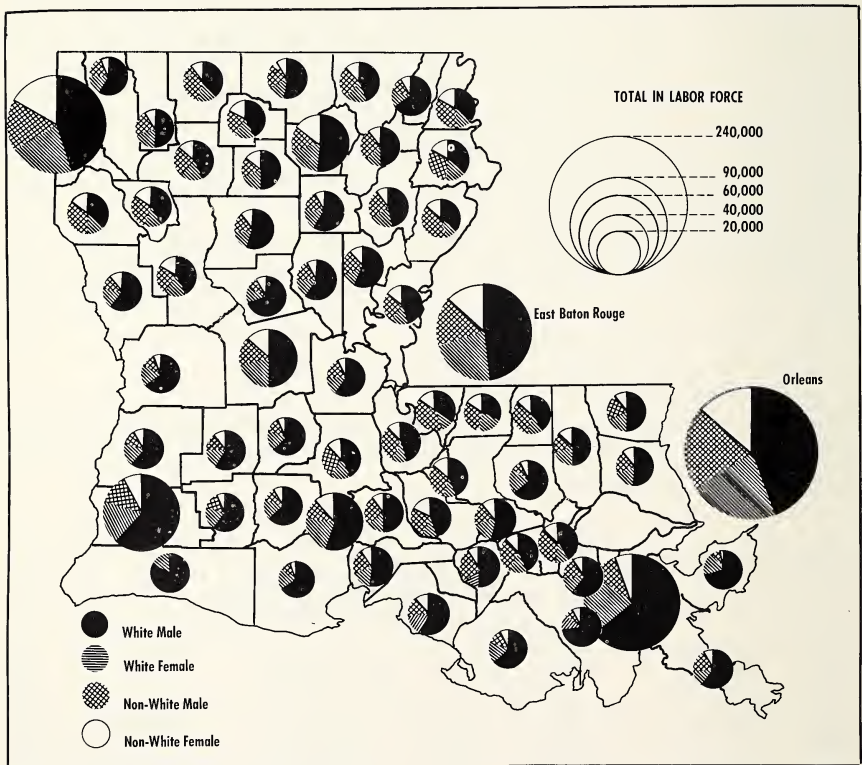


FIGURE 1.—Geographical Distribution of Louisiana's Labor Force by Race and Sex, 1960.



TABLE 3.—Parish Distribution of Louisiana's Labor Force by Sex and Race, 1960

| Parish           | Total Labor Force | Male   |          |          |          | Female |          |          |          |
|------------------|-------------------|--------|----------|----------|----------|--------|----------|----------|----------|
|                  |                   | White  |          | Nonwhite |          | White  |          | Nonwhite |          |
|                  |                   | Number | Per Cent | Number   | Per Cent | Number | Per Cent | Number   | Per Cent |
| Acadia           | 15,269            | 9,680  | 63.4     | 1,718    | 11.2     | 2,792  | 18.3     | 1,079    | 7.1      |
| Allen            | 5,748             | 3,447  | 60.0     | 886      | 15.4     | 974    | 16.9     | 441      | 7.7      |
| Ascension        | 8,233             | 4,493  | 54.6     | 1,546    | 18.8     | 1,384  | 16.8     | 810      | 9.8      |
| Assumption       | 4,878             | 2,509  | 51.5     | 1,295    | 26.5     | 560    | 11.5     | 514      | 10.5     |
| Avoyelles        | 10,761            | 6,423  | 59.7     | 1,810    | 16.8     | 1,592  | 14.8     | 936      | 8.7      |
| Beauregard       | 5,512             | 3,369  | 61.1     | 650      | 11.8     | 1,097  | 19.9     | 396      | 7.2      |
| Bienville        | 4,794             | 2,055  | 42.9     | 1,395    | 29.0     | 703    | 14.7     | 641      | 13.4     |
| Bossier          | 21,308            | 12,666 | 59.4     | 2,889    | 13.6     | 4,104  | 19.3     | 1,649    | 7.7      |
| Caddo            | 85,222            | 38,296 | 44.9     | 15,391   | 18.1     | 18,211 | 21.4     | 13,324   | 15.6     |
| Calcasieu        | 50,973            | 30,749 | 60.3     | 6,559    | 12.9     | 9,666  | 19.0     | 3,999    | 7.8      |
| Cameron          | 2,069             | 1,726  | 83.4     | ...      | ...      | 343    | 16.6     | ...      | ...      |
| Catahoula        | 2,806             | 1,565  | 55.8     | 670      | 23.8     | 302    | 10.8     | 269      | 9.6      |
| Clatborne        | 6,082             | 2,402  | 39.5     | 1,751    | 28.8     | 904    | 14.9     | 1,025    | 16.8     |
| Concordia        | 6,193             | 2,841  | 45.9     | 1,539    | 24.8     | 803    | 13.0     | 1,010    | 16.3     |
| DeSoto           | 7,172             | 2,567  | 35.9     | 2,405    | 33.5     | 1,032  | 14.3     | 1,168    | 16.3     |
| East Baton Rouge | 83,805            | 40,339 | 48.2     | 14,506   | 17.3     | 17,980 | 21.4     | 10,980   | 13.1     |
| East Carroll     | 4,012             | 1,418  | 35.3     | 1,324    | 33.1     | 530    | 13.2     | 740      | 18.4     |
| East Feliciana   | 4,680             | 1,491  | 31.9     | 1,485    | 31.7     | 922    | 19.7     | 782      | 16.7     |
| Evangeline       | 8,425             | 5,221  | 62.0     | 1,423    | 16.8     | 1,337  | 15.9     | 444      | 5.3      |
| Franklin         | 7,355             | 3,607  | 49.1     | 1,629    | 22.1     | 1,257  | 17.1     | 862      | 11.7     |
| Grant            | 3,526             | 2,072  | 58.8     | 526      | 14.9     | 671    | 19.0     | 257      | 7.3      |
| Iberia           | 17,125            | 9,557  | 55.8     | 2,885    | 16.8     | 2,855  | 16.7     | 1,828    | 10.7     |
| Iberville        | 8,675             | 3,868  | 44.6     | 2,390    | 27.6     | 1,034  | 11.9     | 1,383    | 15.9     |
| Jackson          | 5,308             | 2,713  | 51.1     | 906      | 17.1     | 1,084  | 20.4     | 605      | 11.4     |
| Jefferson        | 73,009            | 46,568 | 63.8     | 6,547    | 9.0      | 16,182 | 22.2     | 3,712    | 5.0      |
| Jefferson Davis  | 9,538             | 5,749  | 60.4     | 1,188    | 12.4     | 1,882  | 19.7     | 719      | 7.5      |
| Lafayette        | 29,954            | 16,311 | 54.4     | 4,208    | 14.1     | 6,517  | 21.8     | 2,918    | 9.7      |
| Lafourche        | 17,481            | 12,542 | 71.7     | 1,291    | 7.4      | 3,002  | 17.2     | 646      | 3.7      |
| LaSalle          | 3,915             | 2,796  | 71.4     | 282      | 7.2      | 657    | 16.8     | 180      | 4.6      |
| Lincoln          | 9,487             | 3,946  | 41.6     | 2,021    | 21.3     | 1,742  | 18.4     | 1,778    | 18.7     |
| Livingston       | 7,882             | 5,205  | 66.0     | 677      | 8.6      | 1,628  | 20.7     | 372      | 4.7      |
| Madison          | 4,754             | 1,513  | 31.8     | 1,781    | 37.4     | 600    | 12.6     | 860      | 18.2     |
| Morehouse        | 9,651             | 4,430  | 45.9     | 2,384    | 24.7     | 1,604  | 16.6     | 1,233    | 12.8     |

(Continued)

TABLE 3.—(Continued)

| Parish               | Total<br>Labor<br>Force | Male    |             |          |             | Female  |             |          |             |
|----------------------|-------------------------|---------|-------------|----------|-------------|---------|-------------|----------|-------------|
|                      |                         | White   |             | Nonwhite |             | White   |             | Nonwhite |             |
|                      |                         | Number  | Per<br>Cent | Number   | Per<br>Cent | Number  | Per<br>Cent | Number   | Per<br>Cent |
| Natchitoches         | 10,253                  | 4,396   | 42.9        | 2,581    | 25.2        | 1,730   | 16.9        | 1,546    | 15.0        |
| Orleans              | 239,739                 | 106,192 | 44.3        | 48,647   | 20.3        | 53,625  | 22.4        | 31,275   | 13.0        |
| Ouachita             | 35,534                  | 17,525  | 49.3        | 5,774    | 16.2        | 7,461   | 21.1        | 4,774    | 13.4        |
| Plaquemines          | 7,151                   | 4,350   | 60.8        | 1,354    | 18.9        | 847     | 11.9        | 600      | 8.4         |
| Point Coupee         | 5,645                   | 2,621   | 46.4        | 1,763    | 31.2        | 558     | 10.0        | 703      | 12.4        |
| Rapides              | 37,141                  | 18,525  | 49.8        | 6,233    | 16.8        | 7,678   | 20.7        | 4,702    | 12.7        |
| Red River            | 2,727                   | 1,139   | 41.8        | 827      | 30.3        | 367     | 13.5        | 394      | 14.4        |
| Richland             | 6,321                   | 3,124   | 49.4        | 1,552    | 24.5        | 962     | 15.3        | 683      | 10.0        |
| Sabine               | 5,334                   | 3,202   | 60.0        | 763      | 14.3        | 966     | 18.1        | 403      | 7.6         |
| St. Bernard          | 10,192                  | 7,407   | 72.7        | 339      | 3.3         | 2,222   | 21.8        | 224      | 2.2         |
| St. Charles          | 6,161                   | 3,731   | 60.5        | 886      | 16.1        | 870     | 14.1        | 574      | 9.3         |
| St. Helena           | 2,454                   | 1,001   | 40.8        | 844      | 34.4        | 299     | 12.2        | 310      | 12.6        |
| St. James            | 4,883                   | 2,160   | 44.2        | 1,577    | 32.3        | 566     | 11.6        | 580      | 11.9        |
| St. John the Baptist | 5,244                   | 2,207   | 42.1        | 1,754    | 33.4        | 607     | 11.6        | 676      | 12.9        |
| St. Landry           | 23,427                  | 11,063  | 47.2        | 6,051    | 25.8        | 3,534   | 15.1        | 2,779    | 11.9        |
| St. Martin           | 8,133                   | 4,014   | 49.3        | 1,993    | 24.5        | 1,223   | 15.1        | 903      | 11.1        |
| St. Mary             | 15,626                  | 8,720   | 55.8        | 2,845    | 18.2        | 2,343   | 15.0        | 1,718    | 11.0        |
| St. Tammany          | 12,332                  | 6,493   | 52.6        | 2,048    | 16.6        | 2,473   | 20.1        | 1,318    | 10.7        |
| Tangipahoa           | 19,072                  | 9,351   | 49.1        | 3,537    | 18.5        | 3,682   | 19.3        | 2,502    | 13.1        |
| Tensas               | 3,057                   | 1,058   | 34.6        | 1,161    | 38.0        | 322     | 10.5        | 516      | 16.9        |
| Terrebonne           | 18,772                  | 11,987  | 63.8        | 2,451    | 13.1        | 3,084   | 16.4        | 1,250    | 6.7         |
| Union                | 5,116                   | 2,661   | 52.0        | 1,172    | 22.9        | 715     | 14.0        | 568      | 11.1        |
| Vermilion            | 12,627                  | 8,403   | 66.5        | 1,033    | 8.3         | 2,518   | 19.9        | 673      | 5.3         |
| Vernon               | 4,841                   | 3,282   | 67.8        | 325      | 6.7         | 1,013   | 20.9        | 221      | 4.6         |
| Washington           | 14,150                  | 7,183   | 50.8        | 2,528    | 17.9        | 2,863   | 20.2        | 1,576    | 11.1        |
| Webster              | 13,332                  | 6,620   | 49.7        | 2,612    | 19.6        | 2,315   | 17.3        | 1,785    | 13.4        |
| West Baton Rouge     | 4,296                   | 1,906   | 44.4        | 1,289    | 30.0        | 490     | 11.4        | 611      | 14.2        |
| West Carroll         | 3,890                   | 2,508   | 64.5        | 532      | 13.7        | 652     | 16.7        | 198      | 5.1         |
| West Feliciana       | 2,453                   | 747     | 30.4        | 1,076    | 43.9        | 218     | 8.9         | 412      | 16.8        |
| Winn                 | 4,592                   | 2,527   | 55.1        | 833      | 18.1        | 753     | 16.4        | 479      | 10.4        |
| State                | 1,092,385               | 561,589 |             | 194,818  |             | 213,293 |             | 122,682  |             |

Source: U. S. Bureau of the Census. *U. S. Census of Population: 1960. General Social and Economic Characteristics, Louisiana. Final Report*  
 PC 80-100C. U. S. Government Printing Office, Washington, D. C. 1961. Table 83, pp. 193-198; Table 87, pp. 217-221.

or over. Second, there was a tendency for more women to be recorded in the labor force in north than in south Louisiana. More of the parishes in the north and along the Red River had 30 per cent or more women in the labor force than was characteristic of the parishes in the southern part of the state. It was also observed that in the Florida parishes of Tangipahoa, Washington, and St. Tammany, the proportion of women in the labor force was more than 30 per cent.

Place of work by place of residence was first reported in the 1960 census. It is revealed in Figures 2 and 3 that those parishes with major cities tended to retain their labor force within their boundaries. Parishes with small cities or no cities generally lost the human resources of their labor force to adjacent parishes with major cities. White workers were more prone to migrate out of their parishes of residence to work than were nonwhite employees. One should anticipate this parish separation of place of work and place of residence in the urbanized-mass society because most processing, distributing, and manufacturing is done in the larger cities. Agribusiness employment opportunities are greater in the parishes with the larger cities.

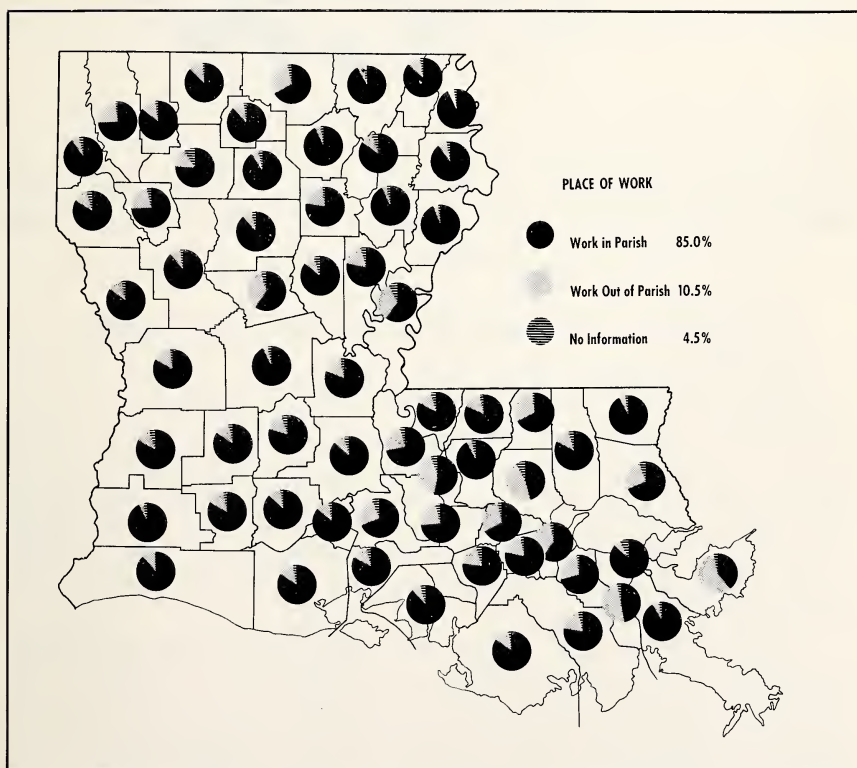


FIGURE 2.—Place of Work by Place of Residence for Louisiana's White Labor Force, 1960.



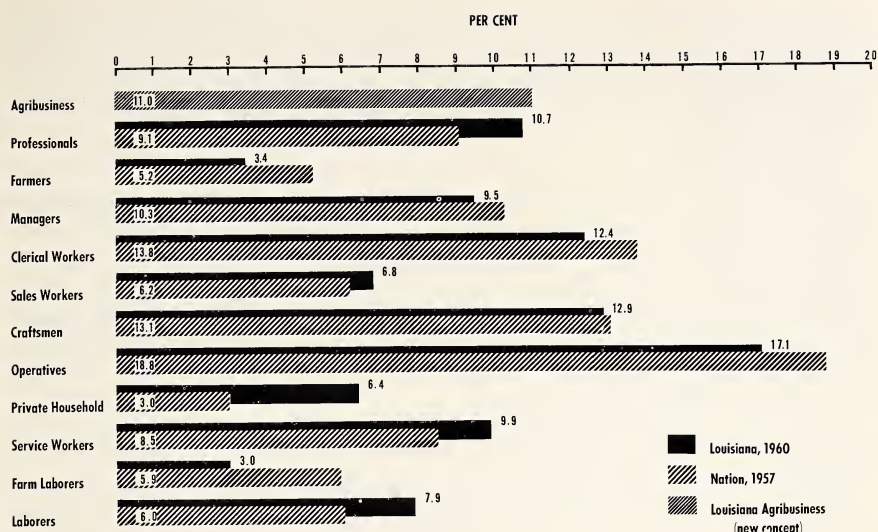
FIGURE 3.—Place of Work by Place of Residence for Louisiana's Nonwhite Labor Force, 1960.

## Occupational Distribution of the Labor Force

Occupational distribution of Louisianans was similar to that of Americans generally. (See Figure 4 and Table 4.) The largest category of workers was *operatives* both in the state and in the nation, 17 and 19 per cent respectively. *Craft and clerical workers* were the next largest categories. Between 12 and 14 per cent of all workers were employed in each of these categories for both the state and the nation. *Professionals and managers* were the next two largest occupational categories. Between 9 and 11 per cent of all workers were in these two categories for both the state and the nation.

At the *unskilled* and *labor* end of the occupational continuum Louisiana had proportionately more workers than the nation. The differences, however, were not great. The proportion of *private household workers* was approximately twice as large in Louisiana as in the nation, 6.4 and 3.0 per cent respectively. *Service workers* in the state and the nation made up 9.8 and 8.5 per cent respectively. *Laborers* made up 7.9 and 6.0 per cent respectively for the state and the nation.





\*Agribusiness workers include farmers, farm laborers, farm suppliers, and food and fiber processors and distributors.

**FIGURE 4.—Major Occupational Categories of Employed Persons in Louisiana, 1960 and the Nation, 1957.**

The proportion of *farmers* was lower in the state than in the nation, 3.4 and 5.2 per cent respectively. Similarly the proportion of *farm laborers* was lower in the state than the nation, 3.0 and 5.9 per cent respectively. It was of greater significance, however, that farmers and farm

**TABLE 4.—Major Occupational Categories Of Employed Persons in Louisiana, 1960, and the Nation, 1957**

| Major Occupation | Number  | 1960      | 1957          |
|------------------|---------|-----------|---------------|
|                  |         | Louisiana | United States |
|                  |         | Per Cent  | Per Cent      |
| Total Employed   | 965,164 | 100.0     | 100.0         |
| Professional     | 103,530 | 10.8      | 9.1           |
| Farmers          | 33,080  | 3.4       | 5.2           |
| Managers         | 91,992  | 9.5       | 10.3          |
| Clerical         | 120,112 | 12.4      | 13.8          |
| Sales            | 65,809  | 6.8       | 6.2           |
| Craft            | 124,908 | 12.9      | 13.1          |
| Operatives       | 164,832 | 17.1      | 18.9          |
| Private House    | 61,566  | 6.4       | 3.0           |
| Service          | 94,803  | 9.8       | 8.5           |
| Farm Laborers    | 28,567  | 3.0       | 5.9           |
| Laborers         | 75,965  | 7.9       | 6.0           |

Source: Donald J. Bogue, *The Population of the United States*, The Free Press, Glencoe, Ill., 1959, p. 247, and U.S. Bureau of the Census, *U.S. Census of Population: 1960, General Social and Economic Characteristics, Louisiana*, Final Report PC(1)-20C, U.S. Government Printing Office, Washington, D.C., 1961, p. 131.

managers ranked tenth out of the eleven occupational categories for both the state and the nation. The only occupational category involving fewer people in the state was that of farm laborers (which ranked eleventh) and in the nation that of private household workers (which ranked eleventh).

It is the thesis of this report that such a small proportion of farmers underrepresents opportunities in the total food and fiber enterprise. When the concept "agribusiness" is used in place of farmers the number of agribusiness workers reaches approximately 10 to 15 per cent of the employees in Louisiana. They constitute one of the largest occupational types in the state. Subsumed into the agribusiness work category are farmers, farm laborers, farm suppliers, and food and fiber processors and distributors.

### Occupational Distribution of Males

In 1940 the largest single male occupational category was farmers, 134,000. (See Figure 5.) Twenty years later the occupational category, farming, had dropped to third from last, to a rank of ninth, and involved only 31,000 people. Farm laborers had experienced a similar drop, from the second largest occupational category in 1940 to the tenth in 1960, or the second smallest. Workers involved in craft and management occupations increased from fourth and sixth positions respectively in 1940 to second and third respectively in 1960. The more than 143,000 operatives constituted the largest single occupational category in 1960. By contrast, operatives were in the fourth position in 1940. The rank of the more than 60,000 professionals in 1960 was fifth. Professionals had ranked tenth in 1940. These changes indicated the striking movement of the Louisiana labor force from rural to urban

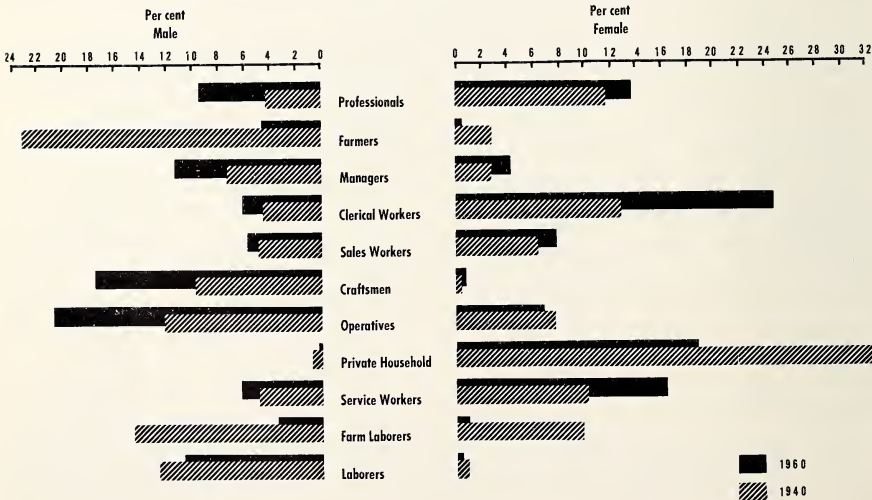


FIGURE 5.—Major Occupational Categories of Employed Persons by Sex, 1940-1960.

work. They also suggested a striking shift from manual to white collar occupations. Such statistics, however, if analyzed only at this level grossly obscure the tremendous development of agribusiness careers. In a following section of this report a detailed analysis of agribusiness as an occupational category is presented.

## Occupational Distribution of Females

Dramatic occupational changes were recorded for women in Louisiana's labor force between 1940 and 1960. (See Figure 5.) The major direction of this shift was from laboring employment to white collar work. Thirty-two per cent of the female labor force was in private household employment in 1940 compared with 19 per cent in 1960. The actual number of women in private household employment, however, increased slightly, from 59,000 to 60,000 during the twenty years. The number of women in clerical work increased from 13 to 24 per cent, or from 24,000 to 78,000. Women in professional work increased from 12 to 14 per cent or from 21,000 to 43,000. Other increases in white collar work were recorded for women in management and sales. Women service workers increased from 10 per cent to 16 per cent, or from approximately 19,000 to 50,000. Other occupational changes in the distribution of women workers were less dramatic.

## Per Cent Change Between 1940 and 1960

The per cent changes of the occupational distributions between 1940 and 1960 are reported in Figure 6. The greatest increases for women during the twenty year period were recorded in the white collar and professional types of occupations. Clerical workers increased by

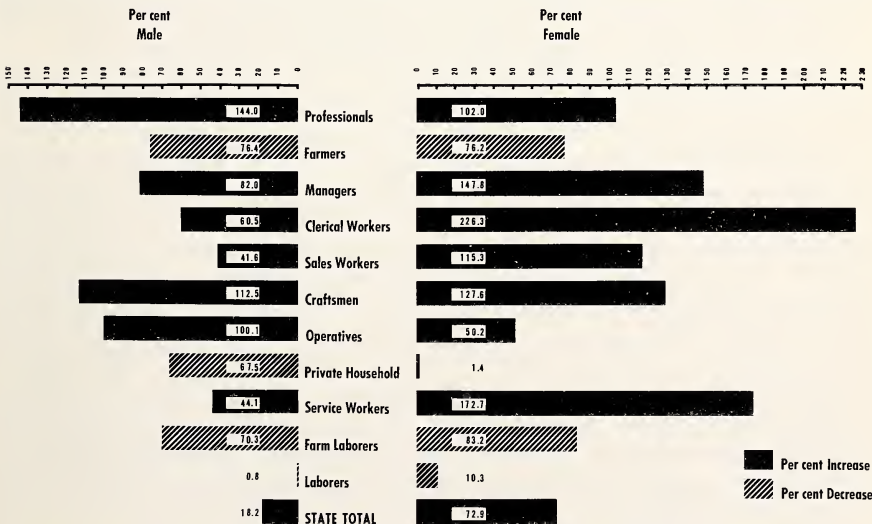


FIGURE 6.—Per Cent Change in Major Occupational Categories, 1940-1960.

more than 226 per cent, managers by more than 148 per cent, sales workers by some 115 per cent, and professionals by 102 per cent. Aside from these major white collar increases, it was also observed that service work increased by 173 per cent and craft work, by 128 per cent. Total female participation in the labor force during this twenty year period increased by 73 per cent.

Changes in male participation in the labor force were far less dramatic. During the twenty years the total increase in male participation was only 18 per cent. Male professions experienced the most rapid increase, 144 per cent. Managers experienced an increase of 82 per cent and clerical workers some 60 per cent. Other major increases were recorded in craft and operative work, each reporting more than 100 per cent growth. Only slight growth was reported in other occupational categories. Precipitous decreases for males were reported in the occupational category of farming, which declined more than 76 per cent; farm laborers, more than 70 per cent; and private household workers, more than 67 per cent.

## Agribusiness Labor Force

Farming is America's classical rural occupation. It dominated as a way of life during the colonial and early national period. More than half of the nation's labor force was employed in agriculture until 1880.<sup>6</sup> Since then most of the nation's workers have departed from the farms. But the occupation whose responsibility has been to feed the nation's people has retained an aura of grandeur and importance in excess of the numbers of people in it. The family farm<sup>7</sup> is as much a part of American ideology as the Christian ethic and monogamous marriage. However, like the so-called independent general practitioner of medicine, the family farm stands in jeopardy in urbanized society.

In Louisiana, agriculture dominated the occupational scene for an even longer period than in the nation. It was only in 1920<sup>8</sup> that more than half of the state's labor force was employed in non-agricultural work.

Abundance and over-abundance have come to characterize North American food and fiber production. Due to advances in technology, vertical integration, and a variety of other conditions, the image of agriculture as a way of life and as an occupation has fallen suddenly into limbo. Many have cited this as the decline and fall of agriculture. From many systematic sources the rural youth of the land have been admonished that there are few opportunities in agriculture, and that if wise they will prepare themselves for an industrial or related career.

In Louisiana, Engle estimated that 82 per cent of approximately 12,000 rural males who will annually enter the labor force between 1960 and 1970 will have to choose some occupation other than farming.<sup>9</sup> It is probable that there will be farming opportunities for only 17 per cent of the rural youth. (See Figure 7.)

These types of analyses are correct, but they do not illustrate careers



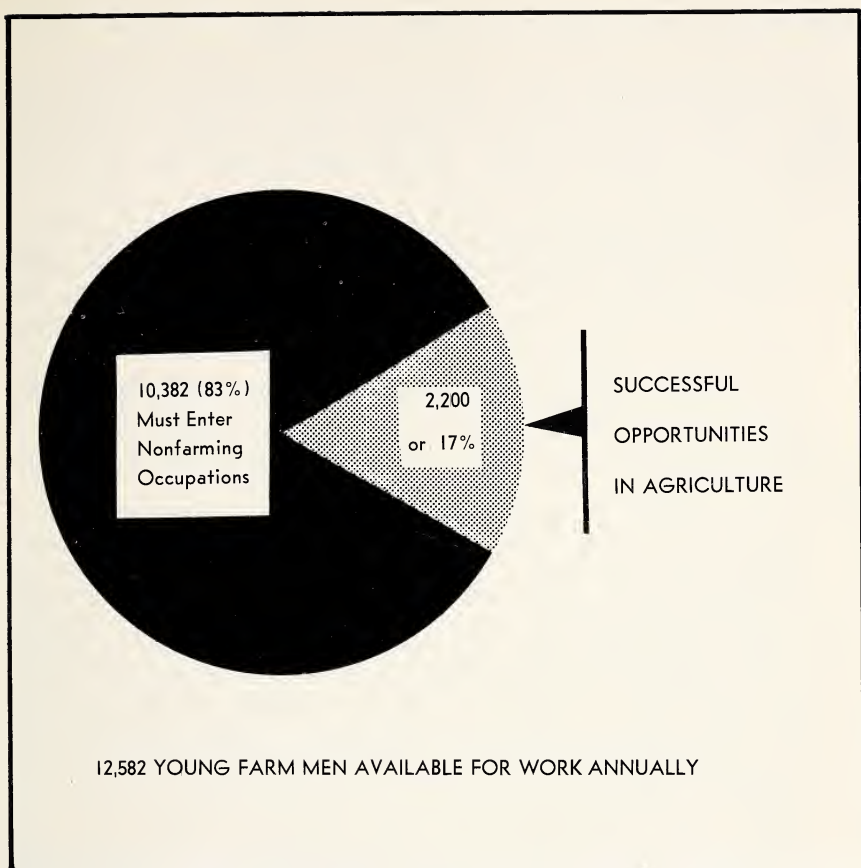


**FIGURE 7.—Louisiana Farm Youths Ready to Work.**

in agribusiness. Indeed, most careers in food and fiber production in the second half of the twentieth century will not be on farms as such. Processing and distributing basic food and fiber products have been greatly removed from the farm. Production of farming supplies and equipment also have been removed from the farm. Consequently, one finds that the *careers in agribusiness are of three major types, namely, farm production, processing-distributing, and supplying.*

For many of Louisiana's rural youth there are real and important agribusiness opportunities. An understanding of these opportunities and an adequate preparation for employment in them will reduce the trauma and frustration of many who come from areas where there is little or no opportunity to take up farming as an occupation. Closely related agribusiness occupations will provide fruitful and gratifying careers for those who desire employment that is oriented to rural life.

## Agribusiness As a Socio-Economic Concept

The concept "agribusiness" was first introduced in 1955 by Davis.<sup>10</sup> The original statement of the concept was more economical than sociological. It had to do more with the dollars and cents value of production and sales than with the number of people employed in the various operations.

The concept of agriculture as an industry in and of itself or as a distinct phase of our economy was appropriate 150 years ago when the typical farm family not only raised crops and livestock but also produced its own draft animals, tools, equipment, fertilizer, and other production items; processed its own food and fiber; and retailed in the community most of the excess above family needs. Then virtually all operations relating to growing, processing, storing, and merchandising food and fiber were a function of the farm. This being the case, it was appropriate to think of all such things as within the scope of the meaning of the word "agriculture."

. . . Basically, farming has changed from a subsistence to a commercial status in that now the progressive farm family consumes only a fraction of what it grows—the balance being sold to feed the 88 per cent of the population employed off the farm. The modern farmer is a specialist who largely confines his operations to growing crops and livestock. The functions of storing, processing, and distributing food and fiber have been transferred in large measure to off-the-farm business entities. These enterprises, too, have become highly specialized operations. Complementing this development has been the creation of still another array of specialized off-the-farm functions—the manufacture of farm supplies, including implements, tractors, trucks, tractor fuels, fertilizers, feed supplements and mixed feeds, insecticides, and weed controllers, plus a host of other items. Today, the combined off-farm functions are considerably larger in magnitude than is the total operation of all our farms.

Despite the changes that have taken place, the functions of manufacturing farm supplies and storing, processing, and merchandising farm commodities still are closely related to agricultural production. Our farms could not operate for one week if they were cut off from these services. And, by the same token, the business firms which serve agriculture rely on farmers for their markets and for some of their supplies. There is a two-way interdependence with businessmen and farmers in the dual roles of suppliers and purchasers.

. . . By definition, agribusiness means the sum total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing, and distribution of farm commodities and items made from them. Thus, agribusiness essentially encompasses today the functions which the term agriculture denoted 150 years ago.<sup>11</sup>

Davis and Goldberg did, however, report both the economic value of agribusiness production and the number of people in the agribusiness labor force. Twenty-four million people, or approximately 37 per cent

of the labor force, were estimated to be in agribusiness in 1954. This view was in sharp contrast with the more traditional statements which reported the number of farmers at that time as approximately 4.7 million and declining. Moreover, it was observed that of the 4.7 million farmers, 2 million large operators produced most of the nation's food and fiber.<sup>12</sup> Data of this type are cited as evidence of the declining occupational opportunities in farming. From a sociological point of view the suggestion that 37 per cent of the nation's labor force was in agribusiness was overly optimistic. Nevertheless, it was more correct than the minimum statement illustrating the number of people in the large economic farm operation classes.

## **Agribusiness as an Occupational Category**

As an occupational category agribusiness requires some special delineation which partially but critically differentiates it from the economic concept. The notion of agribusiness both occupationally and economically includes three major components, namely, the manufacture and distribution of farm supplies; the production of farm commodities; and the storing, processing and distributing of food and fiber products. The primary distinction between the economical and occupational concepts of agribusiness centers in whether or not one includes only those workers in occupations dealing with primary agricultural products (occupational agribusiness), or workers dealing with primary agricultural products and derived products (economical agribusiness). Thus, the definitional scope of occupational agribusiness includes workers in the distribution of agricultural supplies directly to farmers, the worker in the production of agricultural food and fiber products, and the worker in the distribution (transportation) of the raw (primary) agricultural product to storage and processing centers.

The following discussion further illustrates the distinction between occupational and economical agribusiness.

In the occupational agribusiness concept, workers who do not directly interact with farm producers are ideally excluded from the agribusiness labor force.

The three major agribusiness components can be grouped into one occupational category because their experience of work is replete with common characteristics. Some indexes of this rural experience of work are: language, knowledge of open country life, primary interactional relationships, attitude toward work, similarity in avocational interests, type of technical knowledge, and type of skill.

There are great differences in the work experiences of a Louisiana cattle rancher and a doctor of science directing a research project at a United States Department of Agriculture Research Center. Indeed, agribusiness occupations are a heterogeneous lot. Nevertheless, their central focus of concern binds them in an idiom of work which is inextricably a part of the agribusiness whole. Any part separated from the whole becomes a different occupational category.

Lines of unity in agribusiness work are as great as those in the extremely divergent positions which are collectively called the professions or in those nearly estranged jobs commonly referred to as executive occupations. Skilled or blue-collar workers are great in number and divergent in type, but they still have several unifying characteristics. All of this is to observe that in the various major work categories there are vast differences in the actual content of particular jobs. But the meaning of the job for an individual and its function for society may have a structural and organizational content which is most similar to a whole variety of jobs and tasks in the broader occupational category. Lawyers and physicians have a specific content of work which is so vastly different that they are not interchangeable, but both are correctly called professionals. The top administrator of a fertilizer manufacturing firm and the top administrator of a major art museum may both be properly referred to as executives, but the content of their work experience is so divergent as to make them unlikely candidates for each other's position. Yet their processes of work will be of a common type, namely, organizing, collecting information, making decisions, and carrying out programs.

One would have a very partial, if not incorrect, knowledge of the professions if one were to study only lawyers. Knowledge of executives would be equally spurious if obtained solely from studying General Motors' top management. In like manner, knowledge of America's food and fiber production is partial—indeed incorrect—if one studies only farmers, or even farmers and ranchers; only "commercial farmers," or even commercial and "other farmers." People who work in America's food and fiber production enterprises of the middle twentieth century are indubitably found on the farm, in the processing plants, and in the supplying firms. The most adequate name given to these three inter-related categories of food and fiber work is agribusiness. The core of the concept is clear; it is similar to that of the professions, executives, skilled workers, and many other categories of work. The periphery of the concept and the boundary maintenance around the borders are as diffuse and unclear as those experienced in professional, executive, blue-collar, and many other kinds of work.

Some indexes of the characteristics of agribusiness work have been projected to provide a systematic basis for delineation of the boundary. For example there will be many common vocabulary words in the language of agribusiness workers such as rice farmers, county agents, experiment station researchers, secretaries in agricultural extension offices, farm machinery salesmen, and food processors and distributors. The farmer must know enough of the research specialist's language to utilize his findings, and the research specialist must know enough about the farm to design research projects which will have meaning and applicability. The secretary in a county agent's office will use a vocabulary in the course of her daily work that will be sharply differentiated from that used by a secretary in a major art museum.



Quantity of social interaction is another index which denotes the characteristics of agribusiness work. An assembly line worker for the Ford Motor Company in Detroit may actually be contributing to the manufacture of tractors, most of which are a type to be used by farmers. Such a worker may be fully cognizant of the fact that the tractors are for farming. But aside from this minimum knowledge, the assembly line worker may seldom, if ever, have any direct social interaction with farm people. He needs to have little or no understanding of how the piece of machinery on which he works will be applied in the production of farm products. Such workers will have higher frequencies of social interaction with other industrial workers than with farm people. By contrast, the engineers who designed the tractors must have a sufficient amount of social interaction with farm people to know whether the instrument of machinery which they are designing will have practical application.

Agricultural machinery salesmen are an integral part of the agribusiness work force because they have a high rate of social interaction with farmers. They must use a rural vocabulary to establish rapport with the persons to whom they make sales. Furthermore, salesmen must have some general knowledge of the way in which the product they sell will be used in order to adequately explain the product and insure the customer's confidence. The knowledge of the sales personnel may often come from sales training courses rather than from practical experience. The sales training may involve some practical demonstration, even to the extent of making it possible for salesmen to demonstrate the equipment.

Occupational agribusiness and economical agribusiness differences can be further illustrated by the case of their relation to the furniture and fixture industry. From the point of view of economics, furniture and fixture businesses are included as a part of the agribusiness system because the cotton textile and much of the lumber used in furniture is produced by farmers. Rural gross sales are increased by this market's utilization. From the point of view of occupational agribusiness very few, if any, of the furniture and fixture employees work in an agricultural social setting. They use derived rather than primary agricultural products. They have a minimum of social interaction with the farmers who produce the primary materials. In the manufacture of furniture and fixtures there is very little vocabulary of an agricultural type. Technical knowledge systems of the farmers and the furniture manufacturers typically do not overlap. There is little need for the furniture worker to understand the process of growing cotton in order that he may be able to judge a superior from an inferior textile. Similarly, there is very little need for the cotton grower to have any direct knowledge of the way in which the cotton fabric is used in the furniture industry. Indirectly, there are some relationships between the two. As cotton researchers endeavor to produce a plant that will provide a superior fiber the very notion of superior must be related to its ulti-

mate utility. Aside from this indirect and secondary relationship between the two work situations there is no real connection. If the furniture industry uses more cotton fabric this may lead to increased cotton acreages and to the increased employment of farm workers, or the increased use of mechanization. If it leads to increased workers on the farms, those farm workers will be part of agribusiness.

It is often correct, therefore, to include many derived industries and services as economically a part of agribusiness, while there is little, if any, justification for including the workers in the derived industries as part of the occupational agribusiness category. This means the number of workers in agribusiness will be less when reported by occupational analysis and more when reported by economic analysis.

## **Agribusiness in Louisiana\***

Agribusiness is still a major industry in Louisiana. Collectively, occupations in agribusiness constitute a major type of employment for Louisianans. Food processing uses the largest single number of employees of any manufacturing industry in the state.

Ten per cent or more of Louisiana's labor force is occupationally in agribusiness. (See Table 5 and Figure 8.) The data in Table 5 are the first estimates of Louisiana's agribusiness labor force as an occupational rather than economic category. Many of the individuals included in this estimate of agribusiness workers are reported in the census as operatives, which does not reflect their relation to food and fiber production. Workers in Louisiana's agribusiness labor force were distributed as follows: 54 per cent in farming, 42 per cent in processing-distribution, and 4 per cent in supplying.

The 1959 Census of Agriculture enumerates 74,370 farms and equates this with an equal number of farm operators. Occupationally speaking, however, most of those listed in the Census of Agriculture are in small commercial farm operations or in non-commercial farming. Most of the small farmers occupationally identify with some kind of nonfarm work. Therefore, the Census of Population listing of farmers is occupationally more relevant.

There are fewer than 5,000 agribusiness workers in the supplying enterprises in Louisiana. Many of these workers are employed in agricultural chemical plants.

The agribusiness labor force was not equally distributed throughout the state. Parishes with the greatest proportions of farming enterprise had lesser proportions of supplying and processing-distribution activities. (See Table 5.) Farm supply centers were not equally distributed or accessible to the farmers of the state. Only seven parishes had agricultural supply operations which exceeded 10 per cent of their total

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\* See Appendix for a technical discussion of the source and specific use of the data.

TABLE 2.—Louisiana's Agribusiness Labor Force, 1959

| Parishes         | Supplying* |          | Farming** |          | Processing-* |          | Distribution |          | Total  |          |
|------------------|------------|----------|-----------|----------|--------------|----------|--------------|----------|--------|----------|
|                  | Number     | Per Cent | Number    | Per Cent | Number       | Per Cent | Number       | Per Cent | Number | Per Cent |
| Acadia           | 174        | 4.4      | 2,612     | 65.9     | 1,178        | 29.7     | 3,964        | 100.0    |        |          |
| Allen            | 67         | 5.3      | 359       | 28.0     | 854          | 66.7     | 1,280        | 100.0    |        |          |
| Assension        | 0          | 0.0      | 497       | 79.0     | 132          | 21.0     | 629          | 100.0    |        |          |
| Assumption       | 30         | 1.4      | 890       | 43.1     | 1,146        | 55.5     | 2,066        | 100.0    |        |          |
| Avoyelles        | 117        | 3.8      | 2,572     | 82.5     | 427          | 13.7     | 3,116        | 100.0    |        |          |
| Beauregard       | 6          | 0.5      | 346       | 29.8     | 811          | 69.7     | 1,163        | 100.0    |        |          |
| Bienville        | 2          | 0.2      | 421       | 36.8     | 721          | 63.0     | 1,144        | 100.0    |        |          |
| Bossier          | 14         | 1.3      | 809       | 72.3     | 296          | 26.4     | 1,119        | 100.0    |        |          |
| Caddo            | 195        | 4.5      | 1,631     | 37.7     | 2,505        | 57.8     | 4,331        | 100.0    |        |          |
| Calcasieu        | 240        | 12.3     | 731       | 57.5     | 977          | 50.2     | 1,948        | 100.0    |        |          |
| Caldwell         | 0          | 0.0      | 251       | 69.7     | 109          | 30.3     | 390          | 100.0    |        |          |
| Cameron          | 8          | 4.0      | 191       | 96.0     | 0            | 0.0      | 199          | 100.0    |        |          |
| Catahoula        | 0          | 0.0      | 548       | 82.2     | 119          | 17.8     | 667          | 100.0    |        |          |
| Claiborne        | 0          | 0.0      | 601       | 70.1     | 256          | 29.9     | 857          | 100.0    |        |          |
| Concordia        | 5          | 0.5      | 606       | 66.1     | 306          | 33.4     | 917          | 100.0    |        |          |
| DeSoto           | 0          | 0.0      | 1,022     | 42.2     | 1,402        | 57.8     | 2,424        | 100.0    |        |          |
| East Baton Rouge | 107        | 3.9      | 600       | 21.8     | 2,042        | 74.3     | 2,749        | 100.0    |        |          |
| East Carroll     | 2          | 0.1      | 1,257     | 83.8     | 241          | 16.1     | 1,500        | 100.0    |        |          |
| East Feliciana   | 2          | 0.2      | 842       | 84.5     | 153          | 15.3     | 997          | 100.0    |        |          |
| Evangeline       | 10         | 0.4      | 2,354     | 98.3     | 31           | 1.3      | 2,395        | 100.0    |        |          |
| Franklin         | 33         | 1.3      | 2,473     | 96.1     | 68           | 2.6      | 2,574        | 100.0    |        |          |
| Grant            | 0          | 0.0      | 233       | 100.0    | 0            | 0.0      | 233          | 100.0    |        |          |
| Iberia           | 12         | 0.7      | 1,189     | 66.1     | 598          | 33.2     | 1,799        | 100.0    |        |          |
| Iberville        | 7          | 0.7      | 732       | 68.7     | 326          | 30.6     | 1,065        | 100.0    |        |          |
| Jackson          | 4          | 1.0      | 148       | 37.9     | 239          | 61.1     | 391          | 100.0    |        |          |
| Jefferson        | 293        | 12.0     | 192       | 7.8      | 1,961        | 80.2     | 2,446        | 100.0    |        |          |
| Jefferson Davis  | 112        | 6.3      | 1,317     | 74.6     | 338          | 19.1     | 1,767        | 100.0    |        |          |
| Lafayette        | 13         | 0.3      | 2,555     | 67.7     | 1,209        | 32.0     | 3,777        | 100.0    |        |          |
| Lafourche        | 609        | 26.2     | 922       | 39.7     | 793          | 34.1     | 2,324        | 100.0    |        |          |
| LaSalle          | 0          | 0.0      | 69        | 9.5      | 654          | 90.5     | 723          | 100.0    |        |          |
| Lincoln          | 0          | 0.0      | 463       | 49.3     | 476          | 50.7     | 939          | 100.0    |        |          |
| Livingston       | 4          | 0.4      | 536       | 55.5     | 426          | 44.1     | 966          | 100.0    |        |          |
| Madison          | 12         | 1.5      | 794       | 98.5     | 0            | 0.0      | 806          | 100.0    |        |          |
| Morehouse        | 10         | 0.7      | 1,225     | 89.3     | 137          | 10.0     | 1,372        | 100.0    |        |          |
| Natchitoches     | 21         | 1.4      | 1,350     | 89.3     | 140          | 9.3      | 1,511        | 100.0    |        |          |

(Continued)

TABLE 5.—(Continued)

| Parishes             | Supplying* |          | Farming** |          | Processing-* |          | Total   |          |
|----------------------|------------|----------|-----------|----------|--------------|----------|---------|----------|
|                      | Number     | Per Cent | Number    | Per Cent | Number       | Per Cent | Number  | Per Cent |
| Orleans              | 354        | 2.9      | 484       | 4.0      | 11,370       | 93.1     | 12,208  | 100.0    |
| Ouachita             | 140        | 6.8      | 637       | 30.9     | 1,285        | 62.3     | 2,062   | 100.0    |
| Plaquemines          | 556        | 33.1     | 239       | 14.2     | 884          | 52.7     | 1,679   | 100.0    |
| Pointe Coupee        | 12         | 0.9      | 1,075     | 79.4     | 267          | 19.7     | 1,354   | 100.0    |
| Rapides              | 313        | 7.2      | 1,346     | 31.1     | 2,677        | 61.7     | 4,336   | 100.0    |
| Red River            | 35         | 6.1      | 536       | 93.9     | 0            | 0.0      | 571     | 100.0    |
| Richland             | 4          | 0.2      | 1,706     | 95.4     | 79           | 4.4      | 1,789   | 100.0    |
| Sabine               | 75         | 5.9      | 476       | 37.3     | 724          | 56.8     | 1,275   | 100.0    |
| St. Bernard          | 0          | 0.0      | 94        | 9.0      | 954          | 91.0     | 1,048   | 100.0    |
| St. Charles          | 12         | 6.1      | 186       | 93.9     | 0            | 0.0      | 198     | 100.0    |
| St. Helena           | 0          | 0.0      | 733       | 100.0    | 0            | 0.0      | 733     | 100.0    |
| St. James            | 12         | 0.8      | 723       | 50.2     | 707          | 49.0     | 1,442   | 100.0    |
| St. John the Baptist | 0          | 0.0      | 332       | 90.5     | 35           | 9.5      | 367     | 100.0    |
| St. Landry           | 190        | 3.2      | 5,253     | 89.1     | 451          | 7.7      | 5,894   | 100.0    |
| St. Martin           | 6          | 0.3      | 1,644     | 82.0     | 355          | 17.7     | 2,005   | 100.0    |
| St. Mary             | 236        | 14.9     | 901       | 56.9     | 446          | 28.2     | 1,583   | 100.0    |
| St. Tammany          | 12         | 1.8      | 429       | 65.4     | 215          | 32.8     | 656     | 100.0    |
| Tangipahoa           | 133        | 2.8      | 2,735     | 58.4     | 1,814        | 38.8     | 4,682   | 100.0    |
| Tensas               | 6          | 0.6      | 806       | 80.2     | 193          | 19.2     | 1,005   | 100.0    |
| Terrebonne           | 240        | 10.2     | 506       | 21.5     | 1,607        | 68.3     | 2,353   | 100.0    |
| Union                | 76         | 8.6      | 421       | 47.6     | 387          | 43.8     | 884     | 100.0    |
| Vermilion            | 91         | 3.7      | 2,120     | 85.2     | 276          | 11.1     | 2,487   | 100.0    |
| Vernon               | 6          | 1.1      | 548       | 98.9     | 0            | 0.0      | 554     | 100.0    |
| Washington           | 22         | 1.2      | 1,163     | 61.3     | 713          | 37.5     | 1,898   | 100.0    |
| Webster              | 8          | 0.7      | 559       | 46.4     | 637          | 52.9     | 1,204   | 100.0    |
| West Baton Rouge     | 199        | 32.9     | 405       | 67.1     | 0            | 0.0      | 604     | 100.0    |
| West Carroll         | 11         | 0.7      | 1,556     | 99.3     | 0            | 0.0      | 1,567   | 100.0    |
| West Feliciana       | 0          | 0.0      | 522       | 63.7     | 297          | 36.3     | 819     | 100.0    |
| Winn                 | 6          | 0.6      | 174       | 17.7     | 801          | 81.7     | 981     | 100.0    |
| State Total          | 4,864      | 4.2      | 61,647    | 53.7     | 48,247       | 42.1     | 114,758 | 100.0    |

\*Source: U. S. Bureau of the Census and U. S. Bureau of Old Age and Survivors Insurance, cooperative report, *County Business Patterns, First Quarter, 1959*, Part 8A, West South Central States (Arkansas, Louisiana, Oklahoma), U. S. Government Printing Office, Washington, D. C., 1961.

\*\*Source: U. S. Bureau of the Census, *U. S. Census of Population: 1960, General Social and Economic Characteristics, Louisiana, Final Report*, U. S. Government Printing Office, Washington, D. C., 1961.



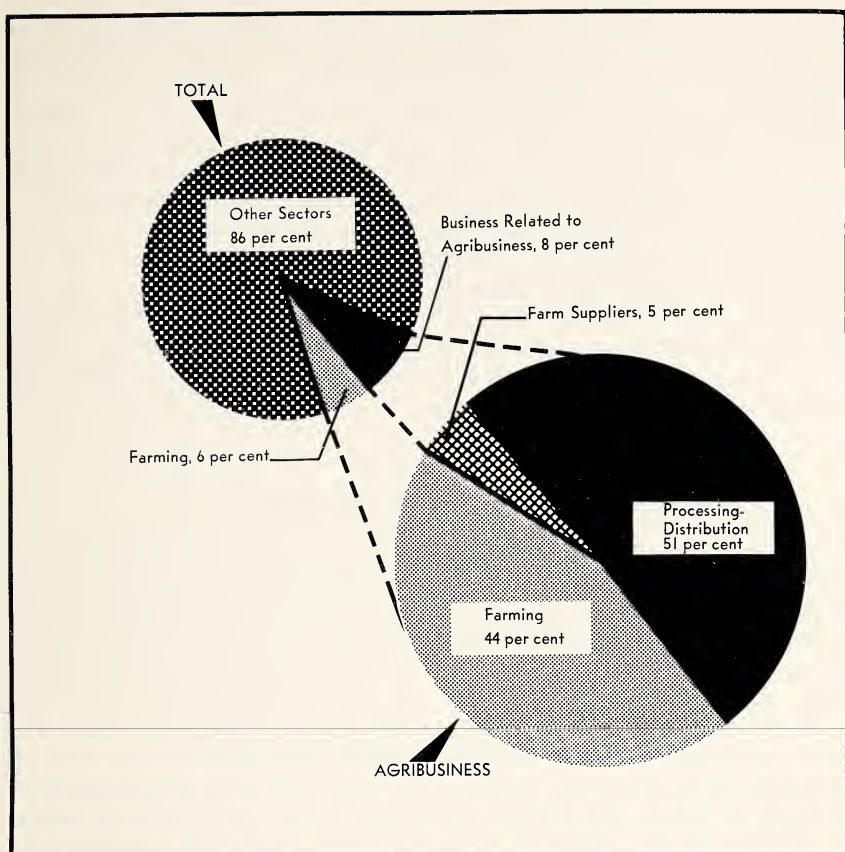


**FIGURE 8.—Louisiana's Agribusiness Labor Force.**

agribusiness labor force. Plaquemines had the greatest proportion with 33.1 per cent of its agribusiness labor force listed as agricultural supply operators. Other parishes with relatively large proportions of supply operations were: West Baton Rouge, 32.9 per cent; Lafourche, 26.2 per cent; St. Mary, 14.9 per cent; Calcasieu, 12.3 per cent; Jefferson, 12.0 per cent; and Terrebonne, 10.2 per cent. Ten other parishes had supply operations of less than 10 per cent of the total agribusiness labor force for the parish but exceeding the average for the state (4.2 per cent). Because of this distribution of supply centers, many farmers must travel great distances within their own parishes or even make purchases in adjacent parishes. Although the data are not conclusive on the point, it is probable that the geographical location of supply operations is closer to the large commercial type farms and, thereby, favors them rather than the small farms.

A similar pattern exists in the processing and distribution phases of agribusiness. Farmers in those parishes with low proportions of

processing and distribution operations experience more difficulties in the transportation of their products to canneries, mills, and refineries. Processing operations are generally concentrated in and around the six metropolitan centers: Caddo, Ouachita, Calcasieu, East Baton Rouge, Orleans, and Rapides parishes.

At this time few predictions are warranted about the future of agribusiness, but it may be that the supply and processing-distribution phases will employ larger proportions of the agribusiness labor force as fewer men are recruited into farming.

Polopolus and Johnson write that there is a ". . . need for trained persons to process and distribute agricultural products, to give special services to people who actually produce these products, and to do research and teaching that will make our agricultural production and distribution even more efficient."<sup>13</sup>

## Professionals and Managers

Professionals and managers together constituted 20 per cent of Louisiana's labor force. They were one of the state's largest occupational categories. These are the *idea people* of the society. Professionals more often than not are concerned with abstract and basic ideas, the results of which quietly make an irrevocable impact on the life of the people of the state. Managers and executives are innovators, generators of many ideas, but more often of a concrete rather than an abstract type. Together, professionals and managers determine and organize the work of the masses in an employee society. This means the idea people organize the work of nearly one-half of Louisiana's labor force, most of which are included in the categories of clerical, sales, craft, and operatives. In short, production, distribution, and consumption are all directed by a powerful 20 per cent of the labor force. This pattern in Louisiana is similar to that of the nation.

Professionals constituted the fourth largest occupational category in Louisiana. Their proportion was nearly the same as that in the nation. Over 60,000 of the professionals were male and 43,345 female, or 58 and 42 per cent respectively. (See Figure 5.) The proportion of male professionals had increased over that of the females in the past twenty years, but the pattern remained fundamentally the same. In Figure 6 it is indicated that the proportion of males in the professions increased by 144 per cent compared with a slightly more than 18 per cent increase of males in the total Louisiana labor force. Between 1940 and 1960 the proportion of female professionals increased by 102 per cent compared with nearly a 73 per cent increase for females in the total Louisiana labor force. Professional work for males increased more rapidly between 1940 and 1960 than for any other single occupational type. For women the increased participation in professions was slow by comparison with their increases in several other major occupational categories.

Managerial occupations were male-dominated. Among the 90,000

managers, over 78,000 or 86 per cent were men. (See Figure 5.) Male domination in this occupational category has been characteristic of the post-war years. Women, however, were increasing proportionately more rapidly in managerial ranks than males. (See Figure 6.) Over the twenty years male managers increased by only 82 per cent, while women in the managerial ranks increased by approximately 148 per cent.

Professional and managerial occupations require high levels of educational attainment, typically a college degree. Often they also involve post-graduate training in a professional or graduate school. Entrance into such occupations requires a great deal of understanding on the part of the individual considering the occupational market place. Specifically required are ability and willingness to discipline one's self during a long period of education and training. It also requires a willingness to make short range sacrifices for long range gains. In mass society these occupations provide the individual with the greatest opportunity to be creative. Further inducement into these kinds of occupations is the style of life, which is cultured and middle to upper class. Remuneration is commensurate with class position. And finally in urbanized society these occupations are numbered among those prestigious white collar types of work. Professionals and managers provide independent services to society, often organized as in fee-taking positions; and they also constitute a major salaried element in agribusiness, construction, manufacturing, etc.

## Clerical and Sales Employees

People in clerical and sales occupations are the organizational and distributive functionaries of society. They are middle range workers who make few major decisions, but carry out a multitudinous number of details. Clerical and sales employees are among that great mass of workers whose gainful activity is organized by the smaller proportion of professionals and managers. Their functions in an urbanized-mass society are essential, but their daily work is often routine. Barry has reported concerning these workers:

The greatest gains in white-collar employment between 1900 and 1950 occurred among clerical workers . . . By 1950 they accounted for one out of every three white-collar workers. Employment in stenographic, typing, and secretarial occupations alone increased elevenfold during the first half of the century.<sup>14</sup>

In Louisiana the 120,112 clerical workers constituted 12 per cent of the labor force and rank as the third largest occupational category. (See Figure 5.) Sales workers, by contrast, totaled half the number of clerical workers, or approximately 66,000 and 6.8 per cent. They ranked as the eighth largest category among the eleven major occupational types. Their proportion and rank in the state was fundamentally the same as that in the nation.

Clerical work both in the state and the nation was one of the most female-dominated types of occupation. A great increase in the propor-



tion of women in clerical work has come about since 1940. Nearly 53 per cent of the 50,259 clerical workers in the state in 1940 were males. By 1960 over 77,627 of the 120,112 clerical workers were female.

Clerical work for females increased by 226 per cent between 1940 and 1960. It increased by only 60 per cent for males during the same period. This precipitous increase of female employment in clerical work surpassed all other occupational increases for women. This reflected, in part, the changing normative system which makes it more acceptable for women to work. It also reflects the general shift of the population from rural to urban or to suburban areas. In addition it was partly related to the state's expanding industrialization which offers more opportunities for women than were possible in earlier agriculturally dominated conditions.

Sales work was one of the least dynamic occupations both in the state and the nation. Sales or distributive functions are vital to mass urbanized society, but in recent years they have had to compete in very direct ways with several patterns of vertical integration and automation. In short, the functions of sales and distribution remain important, but the number of people required to implement them has not increased rapidly. Between 1940 and 1960, sales workers increased in Louisiana from only 40,000 to 65,000. During both periods this type of work was male-dominated, 71 per cent in 1940 and 61 per cent in 1960. During the twenty-year period sales employment represented a 42 per cent increase for males and a 115 per cent increase for females. Indeed, the 115 per cent increase, under most other conditions, would be viewed as extremely great, but when compared with a 226 per cent increase in clerical work, the importance of the increase in sales work is sharply diminished.

## Manual Workers

The two largest categories of workers in Louisiana continued to be those of the operatives and the craftsmen. There were 164,832 operative workers and 124,908 craft workers in 1960. (See Figure 5.) The position of operative and craft workers in Louisiana was similar to their rank and position in the nation. Examples of operative and kindred workers reported in the 1960 census were bus drivers, delivery men, taxi drivers, truck drivers, installation men, assemblers, auto service men, parking attendants, bus and street railway conductors, dressmakers, laundry and dry cleaning employees, photographic workers, power station operators, railroad brakemen, smelter men, stationary firemen, textile spinners, textile weavers, etc. Craftsmen and kindred workers were more readily identifiable. Examples of this type of employment included brick masons, carpenters, electricians, painters, paper hangers, plumbers, etc.<sup>15</sup>

Employment in the operative occupations has been male-dominated in Louisiana. In 1940, 83 per cent of these employees were men, and in 1960, 87 per cent were men. This type of occupation was expanding for males. Slightly more than 100 per cent increase was recorded between



1940 and 1960. This made it the third most rapidly expanding male occupation. It was exceeded only by professional and craft work. More women workers were reported in operative employment in 1960 than 1940, but they experienced only a 50 per cent increase which was less than the 73 per cent increase reported for women in the total Louisiana labor force. The problem of development for both men and women in the operative occupations was largely consistent with the recent urbanization and industrialization of the state.

Craft and kindred types of employment had expanded much more rapidly in the past twenty years than operative employment, but in total number these workers were approximately 40,000 fewer than the operatives. Craft work was an almost exclusively male occupation in Louisiana. In 1940 less than 1,000 women were reported in craft employment, and in 1960 slightly more than 2,000 women were reported in the crafts. Men constituted some 98 per cent of the craft employees in both periods. Craft and kindred employment was the second most rapidly increasing type of gainful activity for males in Louisiana. Between 1940 and 1960, employees in this category experienced a 112 per cent increase. While the number of women involved in this kind of employment remained few, they experienced a 128 per cent increase.

These were major middle class occupations in an industrial-urbanized society. High school training was most often adequate. On the job apprenticeship is used to supplement general school training. These occupations are characterized by a high degree of unionization. Their position is strong and largely assured for the decades ahead. However, these occupations must face expanding automation and the shorter work week.

## Service and Laborer Workers

In industrial-urbanized society, the roles of laborers are generally of secondary importance. Into this category are grouped three occupational types—namely, laborers except farm and mine, service workers except private household, and private household workers. In Louisiana, persons in this type of work constituted only 24 per cent of the labor force, or approximately 230,000. In the nation as a whole, these workers constituted an even smaller proportion, 17 per cent. The major difference between the proportions for Louisiana and the nation was explained by the fact that private household workers constituted 6.4 per cent of Louisiana's labor force and only 3 per cent of the nation's.

Service work occupations were best illustrated by bailiffs, bridge tenders, constables, detectives, guards, policemen, sheriffs, watchmen, waiters, cooks, bartenders, barbers, bootblacks, and chambermaids. Also numbered here are elevator operators, hairdressers, housekeepers, janitors, midwives, porters, and practical nurses. Laborers except farm and mine are illustrated by carpenters' helpers, car washers, fishermen, garage laborers, gardeners, longshoremen, oystermen, stevedores, warehousemen, and wood choppers. Private household workers include such occu-

pations as babysitters and laundresses.<sup>16</sup>

The 76,000 laborers in Louisiana in 1960 were virtually all males. (See Figure 5.) In 1940 the situation was the same, so that in both years 98 per cent of these laborers were men. Service work was more equally divided between the sexes. In 1940 nearly 40 per cent of the service workers were female, and by 1960 over half, or 55 per cent, were female. Private household work was nearly as exclusively female as laborer work was male. In 1940, 94 per cent of the private household workers were women. By 1960, 98 per cent were female.

Laborer and private household employment were declining types in Louisiana between 1940 and 1960. (See Figure 6.) There were virtually no opportunities in these occupations in terms of either ideology or social fact. Laborers declined by 1 per cent among men and 10 per cent among women. Private household work declined by 68 per cent among men, but increased 1.4 per cent among women. Service work, by contrast, was a slightly expanding occupation. It offered some opportunities in terms of social fact if not in ideology. Service work for males increased by 44 per cent during the twenty-year period, while for females it increased by 173 per cent.

## Summary

Louisiana's labor force is one of its most important resources. This is particularly true because of changes in farming, agribusiness, and general advances in industrialization. Workers hold a key place in the state's economy and social life.

1. The state's labor force has grown in number. It was 884,164 in 1940, 928,626 in 1950, and 1,092,385 in 1960. It has declined in proportion of the total population, however—37 per cent in 1940, 35 per cent in 1950, and 33 per cent in 1960.

2. The nation's labor force as a proportion of its total population was 42.5 per cent in 1940, 42.7 per cent in 1950, and 41.0 per cent in 1960.

3. The white proportion of Louisiana's labor force increased from 62 per cent in 1940 to 71 per cent in 1960. The nonwhite proportion of the labor force declined from 38 per cent in 1940 to 29 per cent in 1960.

4. The proportion of women in the labor force increased from 26 per cent in 1940 to 31 per cent in 1960.

5. As a proportion of the population age 14 and over, the labor force was 52 per cent in 1940 and 51 per cent in 1960.

6. Geographically, Louisiana's labor force is concentrated in the parishes of Orleans, Caddo, East Baton Rouge, Jefferson, Rapides, Ouachita, Lafayette, Calcasieu, St. Landry, and Bossier. Furthermore, these parishes have a disproportionate number of labor force commuters who live in adjacent parishes.

7. Occupationally speaking, the agribusiness labor force, which includes (a) farmers and farm laborers, (b) farm suppliers, and (c) processors and distributors, involves approximately 114,758 workers or 10 per cent of the total labor force.

# Appendix

Since no standard data have been collected on agribusiness workers the figures reported in Table 5 are derived from U.S. census publications and *County Business Patterns*. The latter source provides the most accurate data for determining the number of persons who either supply farmers with machinery, hardware, seed, fertilizer, and other agricultural services, or who store, process, or distribute agricultural products.

The following data for Acadia Parish are taken from *County Business Patterns*:

| Industry Group                                        | Number of Workers |
|-------------------------------------------------------|-------------------|
| Acadia                                                |                   |
| Total                                                 | 5293              |
| Agricultural Services, Forestry, Fisheries, . . . . . | 71*               |
| Agricultural Services, Hunting, Trapping . . . . .    | 71                |
| Mining . . . . .                                      | 186               |
| Crude Petroleum and Natural Gas . . . . .             | 186               |
| Contract Construction . . . . .                       | 566               |
| General Contractors, Buildings . . . . .              | 164               |
| General Contractors, Except Buildings . . . . .       | 236               |
| Highway and Street Construction . . . . .             | 140               |
| Special Trade Contractors . . . . .                   | 166               |
| Manufacturing . . . . .                               | 787               |
| Food and Kindred Products . . . . .                   | 533**             |
| Grain and Mill Products . . . . .                     | 466               |
| Rice Milling . . . . .                                | (D)†              |
| Transportation and Other Public Utilities . . . . .   | 578               |
| Trucking and Warehousing . . . . .                    | 297               |
| Public Warehousing . . . . .                          | 205               |
| Farm Product Warehousing and Storage . . . . .        | 197*              |
| Communication . . . . .                               | 144               |
| Telephone Communication . . . . .                     | (D)               |
| Electric, Gas and Sanitary Service . . . . .          | 107               |
| Wholesale Trade . . . . .                             | 565               |
| Groceries and Related Products . . . . .              | 183               |
| Groceries, General Line . . . . .                     | (D)               |
| Miscellaneous Wholesalers . . . . .                   | 178               |
| Petroleum Bulk Stations and Terminals . . . . .       | 48                |
| Retail Trade . . . . .                                | 1500              |
| Building Materials and Farm Equipment . . . . .       | 278               |
| Lumber and Other Building Materials . . . . .         | 160               |
| Lumber Yards . . . . .                                | (D)               |
| Hardware and Farm Equipment . . . . .                 | 103*              |
| General Merchandise . . . . .                         | 205               |
| General Merchandise Stores, N.E.C. . . . .            | 99                |
| Food . . . . .                                        | 140               |
| Grocery Stores . . . . .                              | 121               |
| Automotive Dealers and Service Stations . . . . .     | 305               |
| New and Used Car Dealers . . . . .                    | 163               |
| Gas and Service Stations . . . . .                    | 114               |
| Apparel and Accessories . . . . .                     | 82                |
| Furniture and Home Furnishings . . . . .              | 104               |
| Furniture and Home Furnishings . . . . .              | 59                |
| Furniture Stores . . . . .                            | (D)               |
| Eating and Drinking Places . . . . .                  | 220               |

|                                              |     |
|----------------------------------------------|-----|
| Miscellaneous Retail Stores .....            | 166 |
| Drug Stores and Proprietary Stores .....     | 66  |
| Finance, Insurance and Real Estate .....     | 249 |
| Insurance Agents, Brokers, and Service ..... | 33  |
| Real Estate .....                            | 70  |
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#### **\*SUPPLY**

#### **\*\*PROCESSING-DISTRIBUTION**

† (D) denotes figures withheld to avoid disclosure of operations of individual reporting units.

Only two of the industry types, agricultural services with 71 workers and hardware and farming supply operations with 103 workers, or a total of 174 workers, may be classified as agricultural suppliers for Acadia Parish. Two other industry types qualify for classification as processors or distributors according to the authors' definition of the concept agribusiness (cf. p. 17). These were "Food and Kindred Products", with 553 workers, and "Farm Product Warehousing and Storage", with 197 workers, making a total of 750 persons occupied in agricultural products, storage centers, and processing or distributing enterprises. This example, Acadia Parish, illustrates the selectivity with which the data in this bulletin are reported.



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Gilbert G. Engle, "Economic Class of Farmers and Louisiana's Agricultural Production," (Unpublished manuscript, 1962). Engle reports ". . . a total of 125,823 rural youth to be assimilated into the Louisiana labor force between 1960 and 1970. Assuming they will enter the labor force at age 19, an average of 12,582 will enter each year . . . Approximately 2,200 of the 12,501 farm operators in the upper four classes will leave their farms each year and create openings for newcomers. Approximately 12,582 rural males will enter the labor forces each year in the 1960's. Assuming that 2,200 of them can enter successful farming operations, the remaining 10,382, or 82 per cent, must choose other occupations."

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Gladys K. Bowles and Conrad Taeuber, *Rural-Farm Males Entering and Leaving Working Ages, 1940-50 and 1950-60* (Washington, D. C.: United States Department of Agriculture, Agricultural Marketing Service, Series Census—AMS (P-27) No. 22, August, 1956), p. 1. The authors state: "For the entire United States, the number of men aged 20 to 64 in the rural-farm population in 1950 was about 6 million. During the 1950-1960 decade it is expected that about 1.4 million of these men will die or reach retirement age. If there were to be no migration to or from the farm population during the decade, there would be about 2.4 million young men reaching working age to replace them or about 168 for every 100 who would die or reach retirement age. Therefore, if there is no net migration to or from farms of young men entering this working age group and the number of farm job opportunities remains approximately the same as in 1950, only about 60 per cent of the young men reaching working age would find economic opportunity on farms. The ratio of 168 indicates that 40 per cent of the young men now reaching working age could be spared from the rural-farm population without reducing the present number of men of working age. If, as is likely, the number of farms continues to decline between 1950 and 1960, and mechanization continues to increase, even a higher number must seek employment in nonfarm areas."

<sup>3</sup>*I've Found My Future in Agriculture* (American Association of Land-Grant Colleges and State Universities, 1958), "At present, our Land-Grant Agricultural Colleges graduate about 7,000 young men and women each year in agricultural sciences to fill 15,000 jobs."

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<sup>5</sup>T. Lynn Smith and Homer L. Hitt, *The People of Louisiana* (Baton Rouge: Louisiana State University Press, 1952), pp. 112-127.

<sup>6</sup>U. S. Bureau of the Census, *U. S. Census of Agriculture: 1954*, Vol. II, General Report, Chapter IV, Farm Labor . . . (Washington, D. C.: U. S. Government Printing Office, 1956), p. 237.

<sup>7</sup>Joseph Ackerman and Harris Marshall (editors), *Family Farm Policy* (Chicago: University of Chicago Press, 1947); Arthur J. Vidich and Joseph Bensman, *Small Town in Mass Society* (New York: Doubleday Anchor Books, 1960); Joe R. Motheral, "The Family Farm and the Three Traditions," *Journal of Farm Economics*, 33:514, 1951; and Alvin L. Bertrand (editor), *Rural Sociology* (New York: McGraw-Hill Book Co., Inc., 1958).

<sup>8</sup>U. S. Bureau of the Census, *Fourteenth Census of the U. S.: 1920. Population*, Vol. IV, Occupations. Government Printing Office, Washington, 1923, p. 74.

<sup>9</sup>Engle, *op. cit.*, pp. 8-9.

<sup>10</sup>John H. Davis and Ray A. Goldberg, *A Concept of Agribusiness* (Boston: Harvard University, 1957); John H. Davis and Kenneth Hinshaw, *Farmer in a Business Suit* (New York: Simon and Schuster, 1957); and Earl L. Butz, "Agribusiness in the Machine Age," in *Power to Produce: Yearbook of Agriculture, 1960* (Washington, D.C.: U. S. Government Printing Office, 1960).

<sup>11</sup>Davis and Goldberg, *op. cit.*, pp. 1-2.

<sup>12</sup>*United States Agriculture* (New York: Columbia University, 1958), p. 9.

<sup>13</sup>Leo Polopolus and Jack D. Johnson, *Exploring Agribusiness* (Louisiana Agricultural Experiment Station, D.A.E. Circular No. 284, June, 1961). See also Donald S. Moore, *What Agribusiness Means to Dallas* (Texas Agricultural Experiment Station M.P. 355, 1959).

<sup>14</sup>Carol Barry, "The White-Collar Workers in the 20th Century," *Occupational Outlook Quarterly*, 5 (May, 1961), p. 17.

<sup>15</sup>U. S. Bureau of the Census, *U. S. Census of Population: 1960. General Social and Economic Characteristics, Louisiana*. Final Report PC (1)-20C. U. S. Government Printing Office, Washington, D. C., 1961, p. xxi.

<sup>16</sup>*Ibid.*

# Chemical Weed Control In Sweet Potatoes

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Agricultural Experiment Station  
Charles W. Upp, Director



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# Chemical Weed Control in Sweet Potatoes

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## Introduction

Of all the crops in which studies are being made on chemical weed control there is probably none whose yield is more greatly affected by the presence of grass and weeds than sweet potatoes. A small infestation of weeds or grass will greatly reduce the yield of this crop and is most serious the first 40 days after setting the plants. When the vines are large enough to shade the ground, weed and grass growth is fairly well checked.

Studies of labor requirements in growing sweet potatoes before the advent of chemical weed control showed that 25 to 30 man-hours per acre were required to hoe weeds and grass after planting. Farm labor has become increasingly scarce and higher in cost during the past 15 years, making it necessary that the sweet potato farmer adopt some means of reducing this labor requirement. Figure 1 shows a sweet potato field that had grown up in weeds and grass because the farmer could not hoe or cultivate because of rainy weather. It was with the thought of eliminating entirely the operation of hoeing that experiments using chemicals for weed and grass control were started. Machinery as well as methods of applying chemicals was included as part of this study.



**FIGURE 1.**—Hoeing a field of sweet potatoes that had grown up in weeds and grass because of rainy weather. Cost of hoeing this field was about \$30 per acre.

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## Early Experiments

Early experiments were conducted primarily to determine the tolerance that sweet potato plants would have for the various chemicals that were available on the market. Chemicals used were those that had given good grass and weed control when used with cotton or other crops, but it was realized that a sweet potato plant is more tender than a cotton plant and the method of planting is vastly different.

Before machinery could be adapted or developed for applying the chemical, it was first necessary to determine which would be the most feasible—a post-planting or a pre-planting treatment. For a pre-planting application the plants would have to be forced into a soil having a



FIGURE 2.—Single-row transplanting machine of the type used for setting sweet potato plants in Louisiana.



layer of chemical on the surface which could affect the plant roots if this chemical were forced down into the root zone with the plant. The post-planting application would imply that the chemical would be sprayed directly on the plant after planting. In this case the chemical would have to be selective, since it must control weed and grass growth and not harm the sweet potato plants. Since plants are set both by hand (with the use of a stick) and a transplanting machine, all early experiments included both methods of planting. Figure 2 shows the type of transplanting machine used in these tests. The large press wheels enabled the setting of plants when the soil was very damp. Machines having small press wheels have a tendency to collect soil on the wheels when the soil is very wet and will pull some plants up during the process of transplanting. The planter, as shown in Figure 2, has a watering system that is synchronized with the plant setting arm so that water is placed with the plants in the furrow just as the plant is set. This is a saving on water as compared to a planter that continuously pours water into the plant furrow. Figure 3 shows a two-row transplanter using this same type of plant setter mounted on a tractor draw-bar.

Sweet potatoes are planted as vine cuttings or slips on rows  $3\frac{1}{2}$  to 4 feet apart and from 10 to 12 inches in height. The vines or slips are usually set about 12 inches apart in the row. The rows are usually prepared from 10 to 12 days before planting, and the fertilizer is applied prior to planting. The top of the row is dragged off with a flat type of drag just before the plants are set.



**FIGURE 3.—Two-row, tractor-mounted transplanter.**

## Pre-Planting Treatments

The first field experiments in 1950 involved only chemicals applied as pre-planting sprays, since selective type post-planting spray chemicals were not then available. The treatments consisted of applying the chemical as a band spray 16 inches wide on top of the row that had been dragged smooth. Since these chemicals were inhibitor types and not contact killers, it was necessary to smooth the top of the row just prior to planting so that no grass or weed seeds would have already germinated at the time of applying the chemical.

Some results obtained from these early pre-planting spray treatments showed that, for some chemicals, hand-stuck plants were damaged whereas machine-planted plants had little or no damage. Figure 4 shows the effects of a pre-planting treatment on the plant stand for hand-stuck and machine-set plants. Note the poor stand for the row where the plants were hand-stuck.



FIGURE 4.—Comparison of plant stand for hand-stuck plants, left, and machine-set plants, right, where a pre-planting chemical treatment had been used.

Figure 5 shows graphically the yield data from hand-stuck and machine-planted potatoes from plots chemically treated prior to planting. Machine-planted plants consistently outyielded the hand-stuck



plants. It was found that poorly prepared, cloddy rows resulted in poor weed control from the use of chemicals. The action of the soil opener of the transplanter did not disturb the chemical layer which had been applied for the control of grass and weeds as much as was anticipated. As shown in Figure 5, the yield of sweet potatoes was not directly proportional to degree of weed control; however, this may have been due to chemical injury to the sweet potato plants.

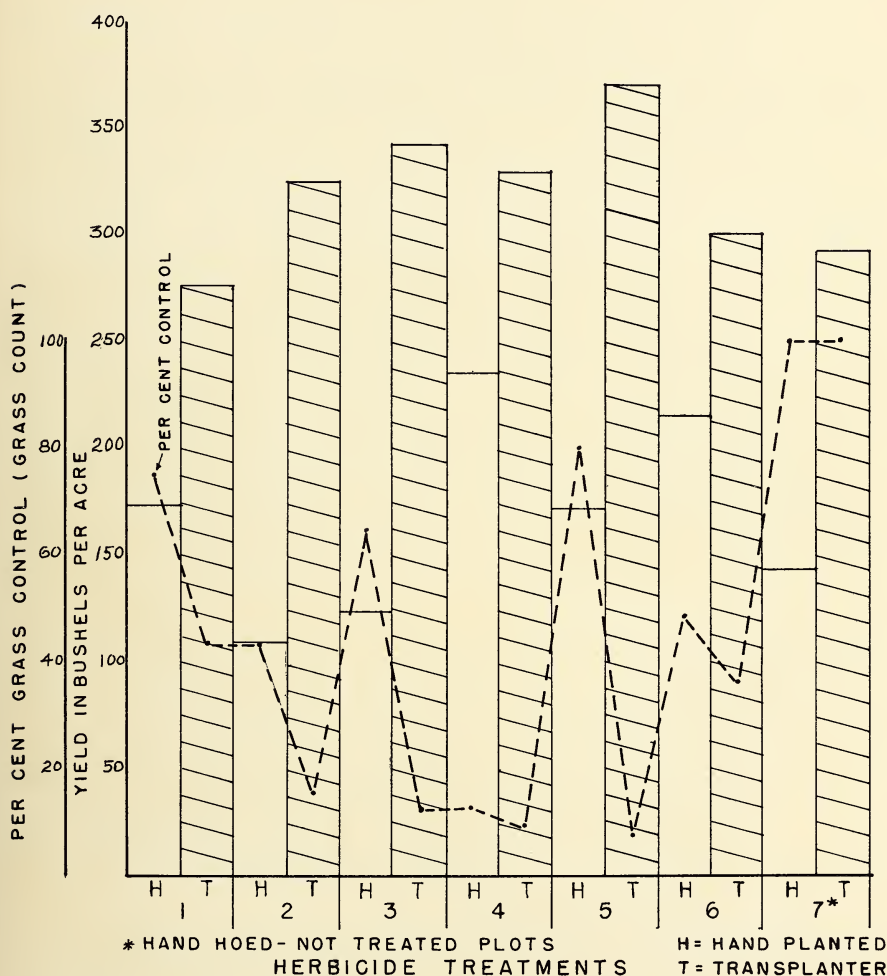
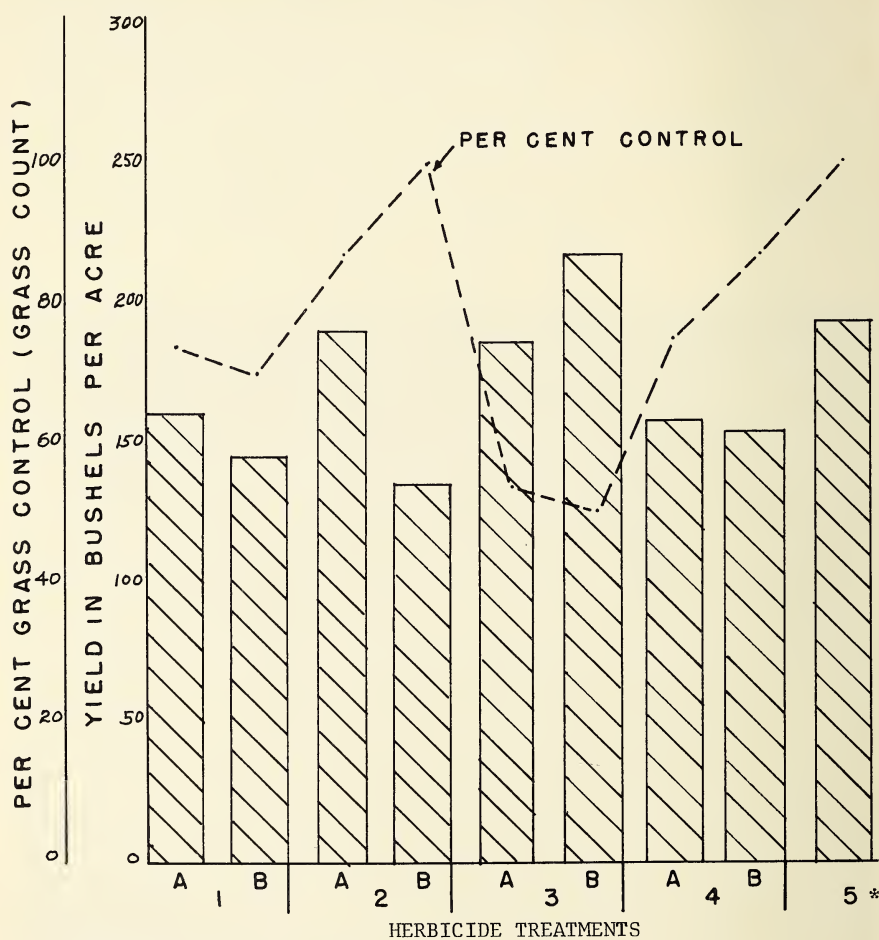


FIGURE 5.—Effect of method of planting and per cent weed and grass control on yield of sweet potatoes for pre-planting treatments of various herbicides. (1953 data.)

The weed counts taken to obtain per cent of weed and grass control were made just before the final cultivation, which was about four to five weeks after applying the chemical. A grass or weed may be

present when the count is made and so must be counted, but this weed can be so stunted from the chemical that it will not develop enough to hinder the growth of the sweet potato plant. This is shown graphically in Figure 6 also, where the per cent of weed control is plotted over the yield for various tested chemicals applied as a post-planting spray on machine-planted plants in 1959.



\*Hand hoed non-treated plots.

**FIGURE 6.**—Comparison of per cent of weed and grass control to yield of sweet potatoes for two rates of application for four treatments of machine-planted plots. Herbicides applied as post-planting treatment. (1959 data.)

From these early experiments it was established that chemicals could be used effectively as a pre-planting application to control grass and weeds in sweet potatoes if certain cautious methods were followed in planting the sweet potatoes.

## Later Experiments

When chemicals became available that could be applied directly on the planted sweet potatoes as a post-planting spray, tests were conducted to determine suitable chemicals as well as methods and machinery for applying them. Generally speaking, it was felt that a post-planting treatment would be better suited to the cultural practices of raising sweet potatoes than a pre-planting treatment.

### Post-Planting Treatments

**Spray Application.**—In the post-planting treatment the rows are dragged just prior to planting to level the soil and remove any grass or weed seeds that have germinated since the row was prepared. After the plants are planted the chemical herbicide is applied as a band spray 16 inches wide. This chemical must be applied as soon after planting the sweet potato plants as possible so that no weed or grass seeds have germinated at the time of applying the herbicide. In the early post-planting experiments both hand-stuck and machine-planted plants were tested. The results of the post-planting tests showed that some herbicides used as a pre-planting treatment could not be used as a post-planting treatment because they caused excessive damage to the plants when applied directly on them.

It was found that where a hole was left open by the stick when setting the plants by the hand-stick method, damage resulted to the plants. It is believed that the hole allowed concentration of the chemical at the root zone, particularly when a slight rain followed a chemical treatment. Machine-planted plants were not affected in this manner, nor were the hand-stuck plants when the holes were carefully closed after planting.

Here again there was no correlation between weed and grass counts and final yield of the sweet potatoes. There was a slight increase in yield of sweet potatoes from the plants that were machine-planted as compared to hand-stuck plants. For all hand-stuck plants, the hole left by the stick was carefully closed before applying the post-planting chemical. It is believed that this difference in yield can be attributed to the deeper setting of the machine-planted plants and the fact that the soil was firmed up around the plants better than is possible when using the hand-stick method. This results in a better growing, earlier and stronger plant than when using a stick to set the plants.

Post-planting herbicide application has been so successful with certain herbicides and so much less trouble than the pre-planting method that tests are no longer conducted using pre-planting sprays. It is believed that better weed control results where the soil is not disturbed after applying the herbicide. Figures 12 and 13 show two types of chemical sprayers used for field application of herbicides. These sprayers usually cover three rows.

Figure 7 shows a typical field scene where a row of sweet potato

plants treated with a satisfactory herbicide is compared to an untreated row of plants.

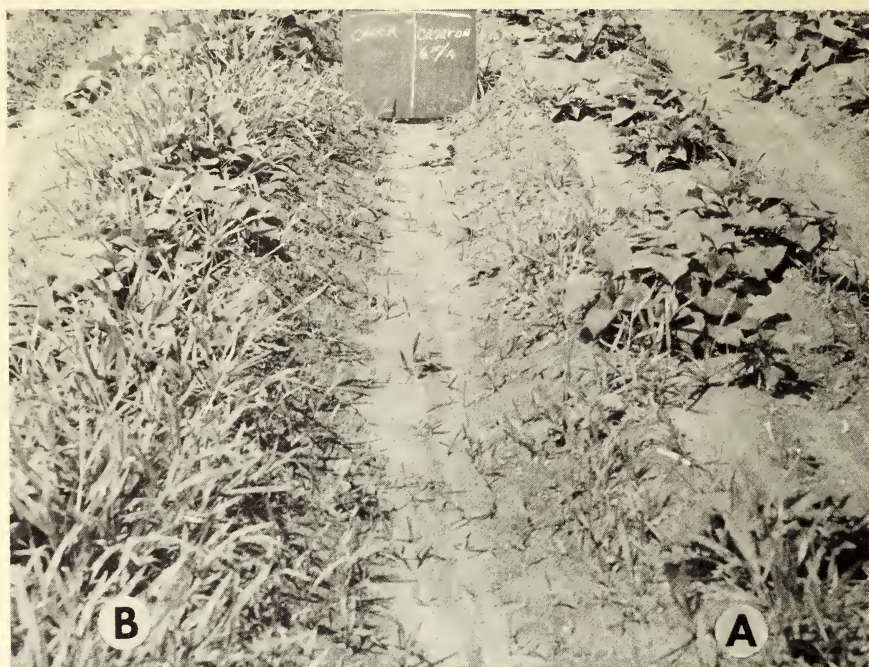


**FIGURE 7.**—Comparison of a row of sweet potato plants treated with a herbicide (A) and an untreated row of plants (B).

In some instances certain herbicides, when applied as a post-planting treatment on the sweet potato plants, seemed to stimulate plant growth and resulted in a greater yield than the check plots which were carefully hoed. This is brought out by the graph in Figure 8. In order to arrive at the most suitable rate of application of a new herbicide, usually four different rates were applied to the sweet potato plants under field tests. In this manner the top limit of tolerance of the plant to the herbicide was established as well as the lower limit of the herbicide for controlling grass and weeds.

**Granular Application.**—When chemical herbicides became available as a granular material they were included in the tests. There has been no significant difference in the degree of weed control or in the total yield of sweet potatoes when comparing granular and liquid herbicides at the same rate of application.

Figure 9 compares several liquid spray herbicides with a granular material of the same chemicals at the same rates of application.

The granular herbicidal material is usually packaged in concentration rates from 5 to 20 per cent. In testing the application methods and



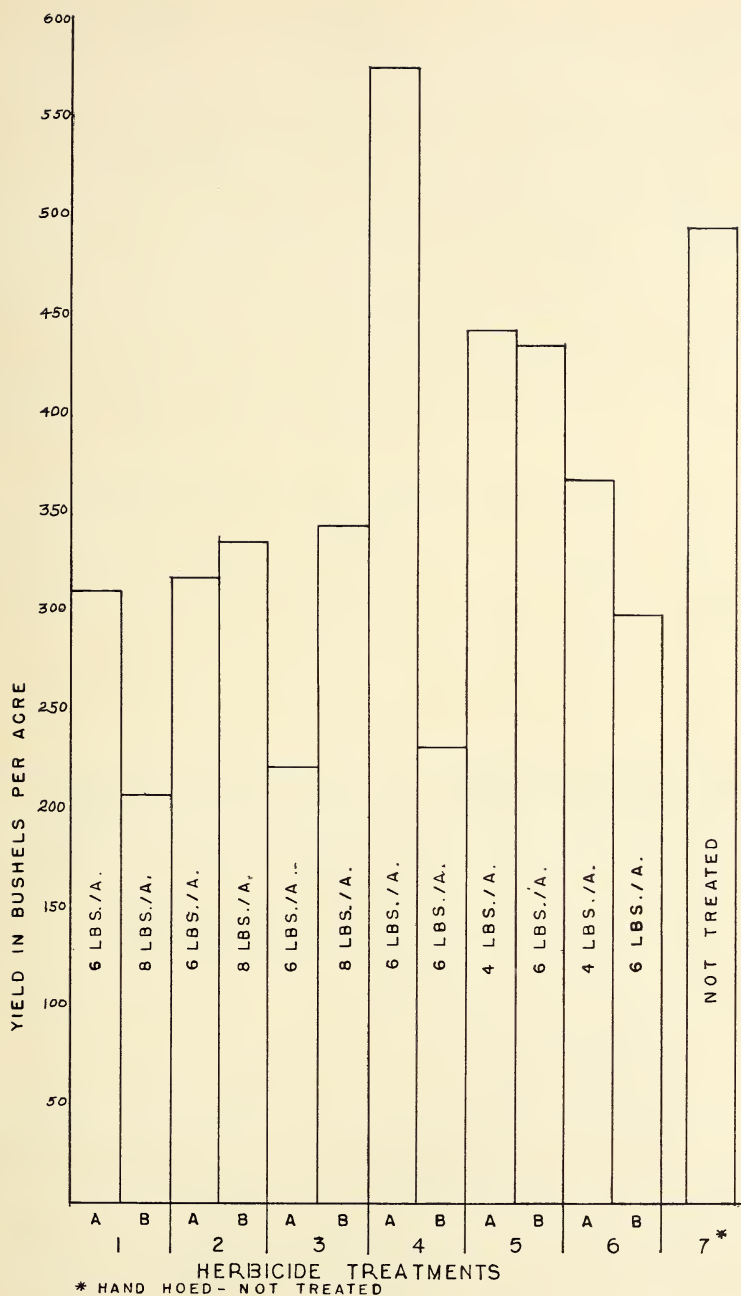


**FIGURE 8.**—Yields of sweet potatoes from plots treated with various herbicides at two rates of application as compared to yield from hand-hoed, nontreated plots. A and B represent the two rates of herbicide application. Rates shown are on an active, blanket basis. (1959 data.)

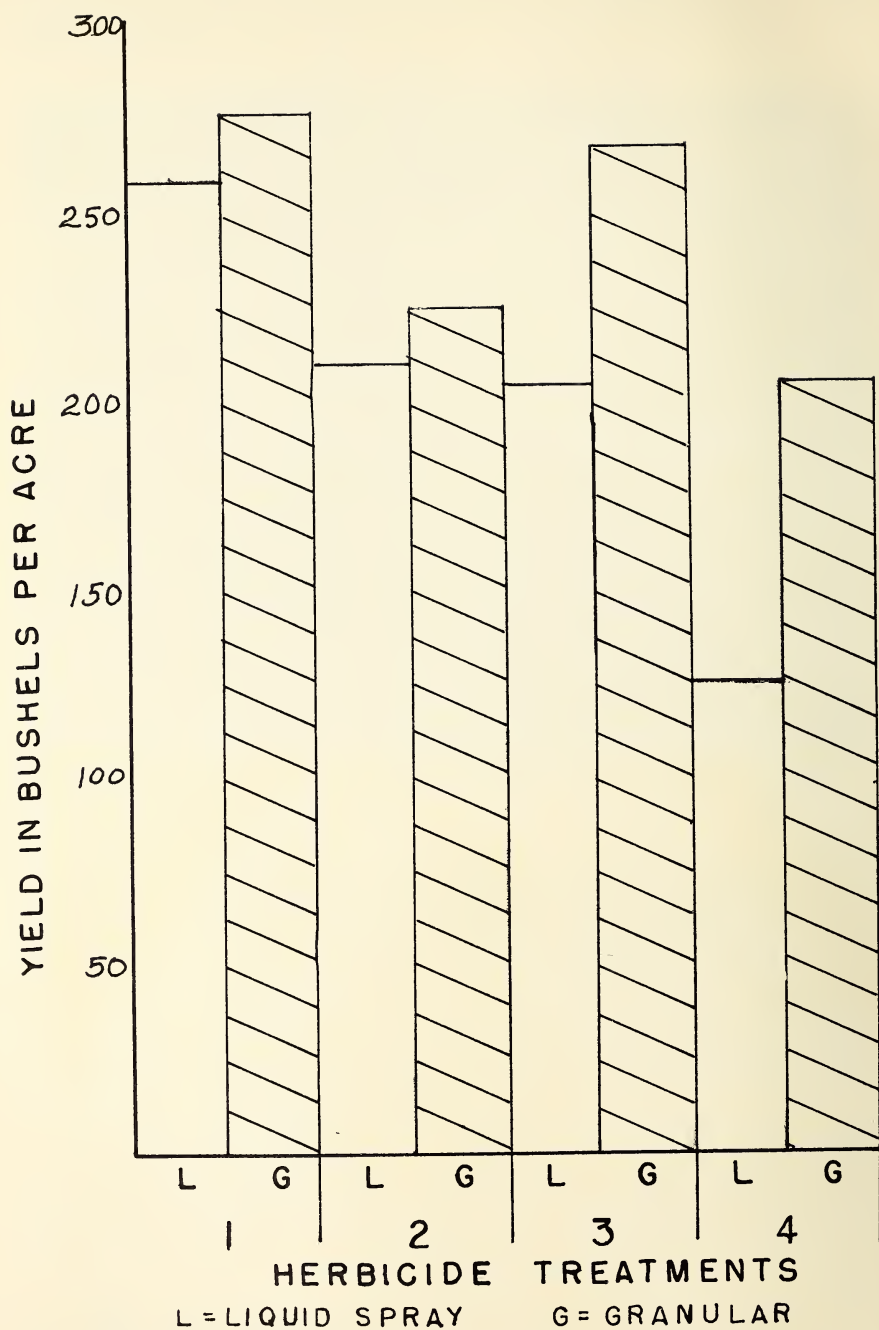


FIGURE 9.—Yields of sweet potatoes from plots treated with granular or liquid spray herbicides, each at the same rate of application. (1959 data.)

machinery for applying these granular herbicides it was found that a concentration rate of 10 per cent was the most suitable from the farmer's standpoint.

Figure 13 shows a single-row granular applicator applying a 16-inch band of granular herbicide. The mounting frame for this applicator was developed by the Louisiana State University Agricultural Engineering Department and this type of machine has become widely used for applying the granular herbicides. While many farmers have liquid sprayers which they use on cotton they seem to prefer the granular herbicide applicator for sweet potatoes. This is probably because the granular applicator is a separate machine and, once calibrated for a granular herbicide, can be pulled by a tractor at any reasonable speed. The metering mechanism is driven by a ground wheel of the applicator. The band width of the applied granular herbicide is 16 inches, the same as for the liquid spray herbicide.

## Effect of Transplanter on Herbicides

When using a transplanter to set sweet potato plants, the previously prepared smooth row is disturbed by both the furrow opener and the press wheels. The row is no longer flat but contains two ridges, one on each side of the plants. These ridges left by the transplanter press wheel can be seen in Figure 2. Studies were conducted to determine if the herbicide, both granular and liquid, would be less effective on rows left uneven on the top by the transplanter as compared to rows that

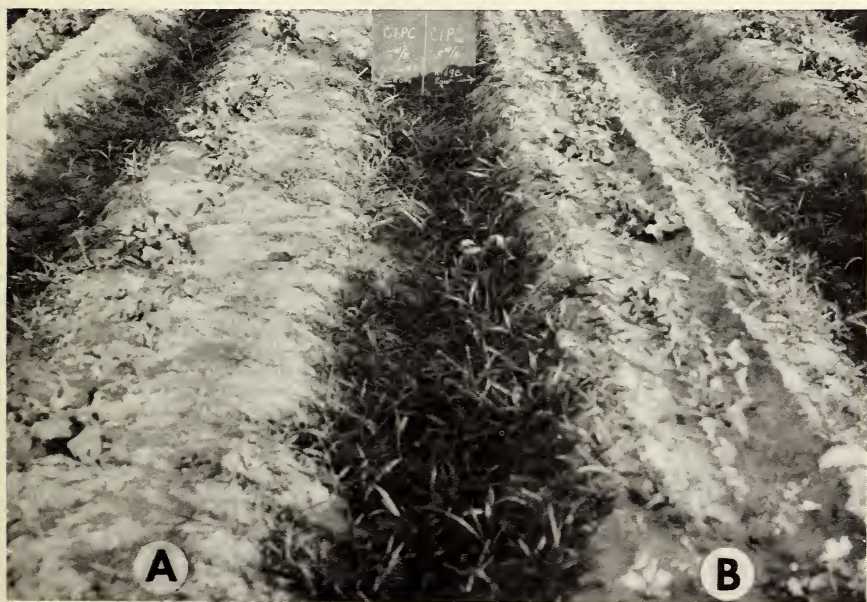


FIGURE 10.—Comparison of the effects of smooth and ridged rows on herbicide control of grass and weeds. (A) Smooth row. (B) Ridged row.

were left smooth after planting. No significant difference in weed control was found in this experiment, which was conducted for four years with several herbicides each year. Figure 10 shows a comparison of a smooth row and an uneven row approximately three weeks after planting and applying a herbicide. There was also no difference in weed control between a liquid spray and a granular herbicide for this test.

## Machinery for Applying Herbicides

### Liquid Sprayers

Most farm-type sprayers can be adapted for applying liquid herbicides by attaching a suitable boom. Some of these sprayers are mounted on a special trailer frame having an auxiliary engine pump and tank mounted on this trailer which is pulled behind a farm tractor. Figure 11 shows this type of farm sprayer. The boom usually is long enough so that the herbicide can be applied to three rows at one time. All spray pumps should have extra capacity so that some of the liquid can be recirculated to the tank to keep the herbicidal material stirred up.



**FIGURE 11.**—A sulky-type spray machine pulled behind a farm tractor. The spray boom covers three rows.

Another essential part on all types of sprayers is a pressure regulator valve. This valve will hold a steady pressure for a given engine speed, thus providing a constant output at the nozzles. The boom holding the nozzles must be able to be adjusted in height so that the nozzles can be set to apply a band spray 16 inches wide on top of the row. The nozzle size found satisfactory for this purpose is the No. 8004 or 8006, and each nozzle head should have a nozzle strainer. A large strainer



that can be easily and quickly cleaned should be installed in the line on the discharge side of the pump. If this strainer is cleaned at least once a day when operating it will not be necessary to clean the nozzle strainers frequently, and trouble in the field will thereby be prevented. The sprayer must be calibrated to apply a given amount of spray over a given length of row. The procedure for calibrating the sprayer is described in the section titled "Calibration of Liquid Sprayer" and in Table 2.

A very simple sprayer can be made to attach directly to the hydraulic lift system of the farm tractor, as shown in Figure 12. The pump is attached directly to the power take-off drive of the tractor, thereby eliminating a separate motor for the pump. A welded metal frame supports the 55-gallon oil drum used as a storage tank for the herbicide materials.



**FIGURE 12.**—A three-row sprayer attached to the hydraulic lift system of the farm tractor. The pump is powered by the tractor power take-off.

This frame is supported by the hydraulic lift system of the farm tractor and can be quickly removed from the tractor if necessary. This sprayer requires the same adjustment in the boom and pressure regulator, etc. as discussed for the sulky-type sprayer. These sprayers are simple and can be built in most farm shops.

### **Granular Herbicide Applicator**

Most of the suitable herbicides for controlling grass and weeds in sweet potatoes can be obtained in granular form. The granules are usually of a clay base and range in size from 30 to 60 mesh. The base

material for the granular herbicide should be a heavy type clay. Light material such as vermiculite is too greatly affected by cross winds to accurately apply the herbicide where desired on the row. If the particle size of the clay-based herbicide is too fine the same difficulty will be encountered in applying it to the row.

The granular material is usually packaged at a 5 to 20 per cent concentration. The 20 per cent concentration is considered too high for general field application with accuracy. A 10 per cent concentration is recommended and even then an accurate type of applicator is required. Figure 13 shows a rear view of a simple, one-row, accurate granular applicator. The herbicide is applied in a band 16 inches wide. The rate of metering the granular herbicide is controlled by a feed roll which is turned through a chain drive from a ground wheel of the applicator frame. Tractor speeds can vary somewhat within reason and not greatly affect the rate of application once the rate is determined and the applicator is set as discussed in a later section under "Calibration of Granular Applicator." The same is not true for the liquid sprayers, as they must travel down the row at the same speed as when calibrated.



**FIGURE 13.—A single-row granular herbicide applicator.**

Since the metering mechanism of the granular applicator is powered by a ground wheel, to stop the applicator from applying the herbicide the tractor driver merely raises the entire applicator off the ground,

which disengages the wheel from the ground. This is easily done since the applicator is mounted on the hydraulic lift system of the farm tractor. This arrangement is more economical than having a clutch on the applicator. Figure 14 shows the granular applicator in the raised position for traveling. In this position the ground wheel is off the ground and will not turn, so no herbicide will be fed from the applicator hopper.

Several manufacturers make a suitable applicator hopper and metering mechanism. Two companies make the frame complete with the applicator hopper and meter mechanism. The frame and drive can be fabricated in the average good farm shop, but the applicator hopper and meter mechanism must be obtained from one of the manufacturers, as accuracy in applying this material is most important. A farm duster or fertilizer applicator cannot be used for this purpose.



**FIGURE 14.**—The granular applicator machine raised off the ground so the ground wheel will not turn and apply the herbicide.

### Calibration of Liquid Sprayer

In order to apply small amounts of the chemical evenly, water must be added to increase the volume for accurate metering. The rate of application is frequently given on a blanket or complete coverage basis. The actual coverage is only on a 16-inch band on top of the row. So for rows 4 feet apart, the material would be placed on only  $\frac{1}{3}$  of the



area. In order to eliminate the calculation for each rate and each row spacing, Table 1 has been prepared which gives the amount of material (chemical and water) to be applied for a 16-inch band. This table applies for all spacings of rows. It is the actual amount of solution to be applied for a given tractor speed.

In preparing the solution, use a clean oil drum which holds 54 to 55 gallons. For the weed control spray, *put in the recommended amount of the chemical and then fill the barrel with water.* Stir thoroughly while filling. Calibrate the sprayer to conform to the amount given in Table 1 for a selected tractor speed by varying the pressure on the nozzle. This will be for 300 feet of row. Actual solution applied to the row is approximately 16 gallons per acre when using a size No. 8004 spray nozzle at about 30 pounds pressure per square inch. Very good agitation is necessary to keep the material properly mixed.

### Calibration of Granular Applicator

To prevent various row spacings from entering into the calculations in arriving at the calibration of the granular applicator, a band coverage 16 inches wide and 32,752 feet long (which is one acre) is used. Most chemical companies are furnishing granular herbicides in a 10 per cent concentration of chemically active material in a heavy granulated clay which was found to be satisfactory for field application. There may be some herbicides available which are 5 per cent and 20 per cent chemically active; therefore, these concentrations are covered in Table 2. Concentration rates of granular herbicides greater than 10 per cent should not be used if a lower concentration is available. High concentration rates may result in inadequate coverage, and their use also increases the margin of error in setting the applicator.

For calibrating the applicator, 300 feet of row should be carefully marked off. Set the applicator rate adjustment dial at some estimated setting and then pull the applicator over the marked 300 feet of row, carefully catching all the material that is dropped from the row bander. A piece of sheet metal or heavy cardboard can be bent in a V-shape with ends taped and used to catch the herbicide. Figure 15 shows how the herbicide is caught for weighing during the calibrating process. The collected material should then be weighed on some type of small accurate scale that is graduated to ounces. The rate of feed for the applicator can then be adjusted, depending on whether it was applying more or less than recommended in Table 2. Usually several trials will have to be made before the proper adjustment can be obtained.

If a weight scale is not available for calibrating the applicator, fairly accurate rate can be arrived at by measuring the collected herbicide in a bottle which is graduated in ounces and fractions of an ounce. Something similar to a wide-mouth nursing bottle should suffice. Because of the variation in particle sizes between one shipment of herbicide and another, this volume method is only reasonably accurate and should be used merely as a substitute method; the rate at which the applicator



is putting out the granules should be carefully checked as soon as a scale is available.

Since the feed shaft of the applicator is turned by a ground wheel of the applicator frame, it is recommended that it not be calibrated on

**TABLE 1.—Calibration of Spray Equipment for Application of Post-Emergence Herbicides to Sweet Potatoes**

(Note: This table is based on a spray band width of 16 inches.)

| Procedure                                                                                                                                                                                                                                                                                                                      | Column 1                   | Column 2                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                | Seconds to travel 300 feet | Time in seconds for one nozzle to deliver one quart |
| STEP 1.—Select gear and throttle setting which gives the desired tractor operating speed.                                                                                                                                                                                                                                      | 34                         | 19.34                                               |
|                                                                                                                                                                                                                                                                                                                                | 36                         | 21.48                                               |
|                                                                                                                                                                                                                                                                                                                                | 38                         | 21.62                                               |
|                                                                                                                                                                                                                                                                                                                                | 40                         | 22.75                                               |
|                                                                                                                                                                                                                                                                                                                                | 41                         | 23.32                                               |
| STEP 2.—Measure off 300 feet and operate tractor at speed selected above. Determine the number of seconds required for tractor to travel the 300 feet. Repeat 2 or 3 times.                                                                                                                                                    | 42                         | 23.39                                               |
|                                                                                                                                                                                                                                                                                                                                | 43                         | 24.46                                               |
|                                                                                                                                                                                                                                                                                                                                | 44                         | 25.03                                               |
|                                                                                                                                                                                                                                                                                                                                | 45                         | 25.60                                               |
|                                                                                                                                                                                                                                                                                                                                | 46                         | 26.17                                               |
|                                                                                                                                                                                                                                                                                                                                | 47                         | 26.73                                               |
|                                                                                                                                                                                                                                                                                                                                | 48                         | 27.30                                               |
|                                                                                                                                                                                                                                                                                                                                | 49                         | 27.87                                               |
| STEP 3.—Nozzle size: Use either No. 8004 or 8006.                                                                                                                                                                                                                                                                              | 50                         | 28.44                                               |
|                                                                                                                                                                                                                                                                                                                                | 51                         | 29.01                                               |
|                                                                                                                                                                                                                                                                                                                                | 52                         | 29.58                                               |
|                                                                                                                                                                                                                                                                                                                                | 53                         | 30.15                                               |
|                                                                                                                                                                                                                                                                                                                                | 54                         | 30.72                                               |
| STEP 4.—See table at right. The average number of seconds determined in Step 2 above may be found in Column 1. The opposite figure in Column 2 is the number of seconds required to deliver 1 quart of spray solution from one nozzle.                                                                                         | 55                         | 31.29                                               |
|                                                                                                                                                                                                                                                                                                                                | 56                         | 31.85                                               |
|                                                                                                                                                                                                                                                                                                                                | 57                         | 32.42                                               |
|                                                                                                                                                                                                                                                                                                                                | 58                         | 32.99                                               |
|                                                                                                                                                                                                                                                                                                                                | 59                         | 33.56                                               |
|                                                                                                                                                                                                                                                                                                                                | 60                         | 34.12                                               |
|                                                                                                                                                                                                                                                                                                                                | 61                         | 34.70                                               |
|                                                                                                                                                                                                                                                                                                                                | 62                         | 35.72                                               |
|                                                                                                                                                                                                                                                                                                                                | 63                         | 35.84                                               |
|                                                                                                                                                                                                                                                                                                                                | 64                         | 36.41                                               |
| STEP 5.—Turn spray machine on and determine the number of seconds required to collect 1 quart of spray from one nozzle. If 1 quart is collected in less time than the figure selected in Column 2, reduce the pressure until time is correct. If time to collect is too long, increase pressure of pump until time is correct. | 65                         | 36.97                                               |
|                                                                                                                                                                                                                                                                                                                                | 66                         | 37.34                                               |
|                                                                                                                                                                                                                                                                                                                                | 67                         | 38.11                                               |
|                                                                                                                                                                                                                                                                                                                                | 68                         | 38.68                                               |
|                                                                                                                                                                                                                                                                                                                                | 69                         | 39.25                                               |
|                                                                                                                                                                                                                                                                                                                                | 70                         | 39.81                                               |
|                                                                                                                                                                                                                                                                                                                                | 71                         | 40.37                                               |
|                                                                                                                                                                                                                                                                                                                                | 72                         | 40.96                                               |
| STEP 6.—Adjust nozzle height so that the band width will be 16 inches wide.                                                                                                                                                                                                                                                    | 73                         | 41.52                                               |
|                                                                                                                                                                                                                                                                                                                                | 74                         | 42.09                                               |

**TABLE 2.—Weight and Volume of Recommended Rate of Granular Herbicide Material for 300 Feet of Row Applied as a Band 16 Inches Wide**

| Material   | Weight |        | Volume<br>(Fluid Ounces) |
|------------|--------|--------|--------------------------|
|            | Grams  | Ounces |                          |
| Alanap 10G | 203.6  | 7.16   | 11.1                     |
| 10% Radox  | 166.2  | 5.86   | 9.6                      |
| 20% Radox  | 83.1   | 2.93   | 4.8                      |
| 5% Eptam   | 499.5  | 17.55  |                          |

rough ground. This would result in uneven and inaccurate application of the herbicide.

Once the applicator is calibrated for a given rate of application and for a specific herbicide, a change in row spacing will not affect the rate of application. It will still put out the desired rate. However, if a different herbicide is used, the applicator will have to be recalibrated because the particle size and density of the material may not be the same for two different herbicides.

Applicators for applying granular herbicides are specifically designed for the purpose and are usually accurate at very low rates. Applicators



**FIGURE 15.—Calibrating the granular applicator.**



designed for applying high rates of materials such as fertilizer or insecticide dust *cannot* be used for this purpose.

## Cultivation

In cultivating sweet potatoes that have been chemically treated, soil must not be placed on the treated area. Set the cultivator sweeps so that the treated area is not disturbed for a period of approximately three to four weeks. Figure 16 shows a tractor-cultivator cultivating sweet potato plants that had been treated with a herbicide. For the final cultivation, or lay-by operation, soil should be pulled up as high as possible on the row disregarding the treated area. This is usually done by using discs set to pull the soil to the plants.



**FIGURE 16.**—Tractor-cultivator cultivating sweet potato plants in a field that had been treated with a herbicide for grass and weed control.

## Second Herbicide Application

In some years frequent rains occur during the spring growing season. In such cases it may be advisable to apply a second application of the herbicide to control late weeds and grass. This second application should be applied immediately after the lay-by cultivation. The rate of applying the herbicide at this time would be the same as for the first application.

### Recommended Herbicides and Rates of Application

The herbicides recommended below are those that have been field tested on sweet potato plants and have proved to be relatively safe to use on plants under normal field conditions and at the same time will give satisfactory weed and grass control. The rates recommended for applying the herbicides apply for silt loam soils. For very sandy soils the rate should be reduced approximately 25 per cent.

**CAUTION:** *Chemical herbicides should not be applied on weak plants such as those that have been forced from hotbeds and not allowed to harden. Apply chemical herbicides only on good strong plants to get the maximum returns from the use of the herbicides for grass and weed control.*

### Liquid Forms

The following recommendations are made for applying herbicides to sweet potatoes as a post-planting band spray 16 inches wide. Refer to Table 1 for adjusting the sprayer to put out the correct amount of the mixture of the herbicide and water as per these recommendations.

**Randox**<sup>1</sup>—Four quarts (8 pints) of Randox emulsifiable concentrate (4 pounds active ingredient per gallon) to 47 gallons of water, or 1.7 pints (27 fluid ounces) per 10 gallons of water.

**Eptam**<sup>2</sup>—Four quarts (8 pints) of Eptam emulsifiable concentrate (6 pounds active ingredient per gallon) to 47 gallons of water, or 1.7 pints (27 fluid ounces) per 10 gallons of water.

### Granular Forms

The following recommendations are made for applying granular herbicides to sweet potato plants as a post-planting band treatment 16 inches wide.

**Randox, Granular.**—Rate is 4 pounds of active material per acre.

**Alanap 10G, Granular.**—Rate is 4.8 pounds of active material per acre.

**Eptam, Granular.**—Rate is 6 pounds of active material per acre.

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<sup>1</sup>Randox as a commercial preparation contains 4 pounds of active material per gallon. The rate as recommended is 4 pounds of active material per acre on a blanket basis.

<sup>2</sup>Eptam as a commercial preparation contains 6 pounds of active material per gallon. The rate as recommended is 6 pounds of active material per acre on a blanket basis.



These rates as quoted per acre are for the ground actually covered in the band application. For instance, a band application 16 inches wide and 32,752 feet long is one acre. Table 2 gives the weight of granular herbicide to apply for 300 feet of row for setting the applicator at the recommended rates.

## Other Herbicides

Other chemicals for controlling grass and weeds in sweet potatoes are now being tested. Some of these herbicides have performed satisfactorily but not enough test data has been collected to make any recommendations at this time. After a herbicide passes the field tests, its use on sweet potatoes must be approved by the United States Department of Agriculture from a toxicity standpoint when the herbicide is applied at the rates recommended.

Both liquid and granular forms of promising herbicides are now under tests at the Chase Sweet Potato Research Center, Chase, Louisiana. As herbicides prove effective in field tests and are approved by the USDA, they will be added to the list of herbicides recommended for grass and weed control in sweet potatoes in Louisiana.

## Summary and Conclusions

1. Herbicides can be effectively used to control grass and weeds in sweet potatoes.

2. When mechanical transplanters were used for setting plants prior to herbicide treatment, these plants gave a higher yield than did the plants that were set by the hand-stick method.

3. Post-planting treatments with herbicides were better suited to field practices than a pre-planting treatment.

4. When plants are set by the hand-stick method, the holes left by the stick must be carefully closed before applying the herbicide.

5. Granular herbicide proved to be just as effective as a liquid spray of the same herbicide.

6. The ridge left by the transplanter press wheel when setting the plants did not hinder the effectiveness of the herbicide which was applied later.

7. Rows made up and left standing must be dragged clean of any germinated weed and grass seed before setting the plants and applying the herbicide.

8. The herbicide should be applied as soon as possible after setting the plants; this time interval should never exceed two days.

9. The effectiveness of the herbicide may vary somewhat depending on weather conditions, but the rates as recommended in Tables 1 and 2 are the most suitable for the conditions that existed over several years of field testing the herbicides listed.



# **Supplemental Feeding Increases Beef Production on Bluestem-Longleaf Pine Ranges**

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Experimental rations were formulated by Dr. Paul B. Brown, Associate Professor, Animal Science Department, Louisiana State University.



# Supplemental Feeding Increases Beef Production on Bluestem-Longleaf Pine Ranges

V. L. DUVALL AND L. B. WHITAKER<sup>1</sup>

Most beef herds that graze yearlong on pine forest ranges in Louisiana are low in productivity. Calf crops average 50 percent or less, and 7-month weaning weights are usually below 300 pounds. Death losses are often high among both young and adult animals. Moreover, many of the calves are in the Utility and Cull slaughter grades at weaning age.

This low level of beef production is largely a result of malnutrition. Range forage, although usually abundant, becomes deficient in protein at maturity, while its phosphorus content is inadequate most of the year (Campbell and Cassady, 1951; Campbell *et al.*, 1954).

Most winter feeding programs devised by stockmen are only partially effective. Generally they reduce starvation losses but otherwise fail to improve calf production. Some cattlemen feed grains that are too low in both protein and phosphorus to supplement the range diet adequately. Others use high-protein supplements but provide too little per day over too short a period—usually 60 to 90 days.

In 1954 the Southern Forest Experiment Station started a study to evaluate and compare two supplemental feeding programs that provided relatively large daily rations for 6 months or longer. These supplements were designed to increase calf crops to 75 percent or more and weaning weights at 7 months to at least 400 pounds. This bulletin reports the 5-year results of the experiment.

## The Feeding Test

### Experimental Ranges

Testing began on two fenced, 570-acre range units of the Palustris Experimental Forest, in central Louisiana. Much of the range area is relatively open grassland with scattered second-growth longleaf pines and cull hardwoods (Fig. 1).

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<sup>1</sup>Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture.



**FIGURE 1.**—The experimental range is representative of the cutover longleaf pine-bluestem type.

Slender bluestem, *Andropogon tener* (Nees) Kunth, and pinehill bluestem, *A. divergens* (Hack.) Anderss. ex Hitchc., are the principal grasses. Panicums, *Panicum* spp., paspalums, *Paspalum* spp., and miscellaneous bluestems, *A. subtenuis* Nash, *A. ternarius* Michx., *A. elliottii* Chapm., *A. virginicus* L., and *A. gerardii* Vitman, contribute substantial quantities of forage. Swamp sunflower, *Helianthus angustifolius* L., and grassleaf goldaster, *Chrysopsis graminifolia* (Michx.) Ell., are the most important perennial forbs. Legumes and grass-like plants are common but produce comparatively little palatable forage.

Blackjack oak, *Quercus marilandica* Muenchh., is the most abundant deciduous tree. Shrubs are widely dispersed; waxmyrtle, *Myrica cerifera* L., is the most common.

Surface texture of soils ranges from silt loam to loamy sand, and permeability is moderate to low. Surface drainage ranges from very good to poor.

## **Range Management**

The range units were stocked yearlong with one adult cow or bull to 20 acres. This rate, calculated to utilize about 40 percent of the herbage, was selected to avoid serious overgrazing during drouths.

From 20 to 30 percent of each unit was burned annually in early May to remove litter, improve palatability and quality of grass, and control hardwoods. A different portion of each unit was burned each year in a 3- to 4-year rotation.

Aside from rotational burning, nothing was done to attract cattle to particular locations. Salt-bonemeal feeders were permanently located near the center of each range. Feeding troughs were moved occasionally, but remained near the salt-bonemeal feeders.

## **Herbage Measurements**

Because the feeding programs were designed to supplement rather than replace range forage in the cattle diet, an adequate supply of herbage was required at all times. To insure that overutilization did not deplete the forage, thereby influencing herd performance, herbage production and utilization were sampled annually in late winter. About 35 clusters of four 3.1- by 3.1-foot quadrats were mechanically spaced in each range unit. One quadrat in each cluster was caged yearlong and three were open to grazing. Caged quadrats were clipped to determine total yield. Utilization was calculated by subtracting residue on uncaged quadrats from total yield. Quadrats were relocated annually to avoid repeated clipping of the same area.

## **Cattle**

For 4 years prior to the study, native cows grazed the experimental area. They were managed like most open-range herds. During winter they generally received enough feed to prevent starvation, but breeding was unregulated and little effort was made to control diseases and parasites. Calf crops averaged about 45 percent, and only a few calves reached 300 pounds by weaning time.

In July 1954, two 27-cow test herds were selected from these cattle. Cows were assigned to herds as equally as possible on the basis of age, size, and breed characteristics. Twenty-five cows were specified as study animals, and the remaining two were replace-





**FIGURE 2.—A portion of herd B in late summer.**

ments. During the 1955 and 1956 breeding seasons herd A cows were mated to a bull that was three-fourths Angus and one-fourth Brahman; otherwise, purebred Shorthorn bulls were used throughout the study.

In 1954, the cows were generally small and thin, averaging a little over 600 pounds. Most were of mixed breeding, but 22 percent were grade Brahmans. Jersey and Brahman ancestry was prominent throughout both herds, and many cows carried 25 to 50 percent British beef and dual-purpose breeding (Fig. 2). Cows were classified into the following categories according to proportion of European and Asiatic breeding: predominantly Brahman, Brahman



crosses, and non-Brahman. Cows classed as predominantly Brahman showed strong characteristics of the breed. Brahman crosses included cows showing evidence of Brahman breeding in combination with Jersey, British beef, or dual-purpose breeding. Non-Brahmans were mainly crosses between Jerseys and British beef breeds.

## Herd Management

Bulls were placed with the herds on February 20 and removed on July 1 each year. Calves were born between December 1 and April 10, and were therefore large enough to eat considerable grass when the forage quality was highest in spring and early summer.

All calves were vaccinated for blackleg, and bull calves were castrated at about 3 months of age. Cows were weighed in April, late July or early August, and November of each year.

Calves were marketed annually in early August, directly off the cows. Immediately after the calves had been shipped, herds were rotated from one range unit to another to minimize the effects of slightly greater herbage production in one range unit than in the other.

Cows with serious physical defects and those that failed to calve once in 2 successive years were culled. These standards, although too lax, are followed by most range cattlemen in Louisiana. Cows lost by death or culling were replaced by similar animals purchased at local saleyards.

Cattle were sprayed three or four times per year with various chlorinated hydrocarbon insecticides to control external parasites.

## Supplemental Feeding

The two herds were managed alike except for the feeding of supplemental concentrates. Beginning in the winter of 1954, herd A was fed a mixed feed composed of several ingredients, while herd B received cottonseed cake. Concentrates were fed in troughs, to allow room for all animals to eat simultaneously.

The herd A concentrate contained supplemental protein and other nutrients believed to be lacking in range forage (Cassady and Whitaker, 1956). Table 1 lists the ingredients and proportions.

Cane molasses was selected for its content of soluble carbohydrates, and cane bagasse served as a carrier for the molasses. Cottonseed meal and alfalfa meal supplied protein, and the latter also served as a vitamin A supplement. Steamed bonemeal was included to improve the calcium and phosphorus content. A trace of cobalt was added because it was not known whether the forage

**TABLE 1.—Formulas for the Herd A Mixed Feed**

| Ingredients                          | Proportions of feed |         |      |
|--------------------------------------|---------------------|---------|------|
|                                      | 1954-56             | 1957-59 | 1960 |
|                                      | Percent             |         |      |
| Cane molasses                        | 40                  | 30      | 30   |
| Cane bagasse                         | 24                  | 20      | —    |
| Cottonseed hulls                     | —                   | —       | 20   |
| Cottonseed meal (41 percent protein) | 14                  | 28      | 28   |
| Alfalfa meal and leaf meal           | 14                  | 14      | 14   |
| Steamed bonemeal                     | 5                   | 5       | 5    |
| Salt with trace of cobalt            | 3                   | 3       | 3    |
| Total                                | 100                 | 100     | 100  |

**TABLE 2.—Feeding Schedule, July 1956 Through May 1960**

| Period                                  | Feeding frequency | Daily feed per cow | Total feed per cow |
|-----------------------------------------|-------------------|--------------------|--------------------|
|                                         |                   |                    | Pounds             |
| <b>Herd A (Mixed feed)</b>              |                   |                    |                    |
| July 20 to October 30                   | Alternate days    | 0.75               | 71                 |
| November 1 to November 28               | Daily             | 1.00               | 28                 |
| November 29 to December 14              | Daily             | 2.00               | 32                 |
| December 15 to December 31              | Daily             | 2.50               | 43                 |
| January 1 to January 10                 | Daily             | 3.00               | 30                 |
| January 11 to March 11                  | Daily             | 4.00               | 240                |
| March 12 to April 4                     | Daily             | 3.00               | 72                 |
| April 5 to May 4                        | Alternate days    | 1.00               | 30                 |
| Extra feed during severe winter weather |                   |                    | 15                 |
| Season's total                          |                   |                    | 561                |
| <b>Herd B (Cottonseed cake)</b>         |                   |                    |                    |
| November 1 to November 30               | Daily             | 1.00               | 30                 |
| December 1 to December 31               | Daily             | 2.00               | 62                 |
| January 1 to March 10                   | Daily             | 3.00               | 207                |
| March 11 to March 27                    | Daily             | 2.00               | 34                 |
| March 28 to May 4                       | Alternate days    | .75                | 29                 |
| Extra feed during severe winter weather |                   |                    | 11                 |
| Season's total                          |                   |                    | 373                |

contained enough of this essential element. Initially the feed contained 11.4 percent crude protein.

Two changes were made in the mixture during the course of the study. The first was in February 1956, when cows that were nursing calves began losing weight rapidly. Suspecting the feed was deficient in protein, researchers reduced the proportions of molasses and bagasse and increased the cottonseed meal. This raised the protein to a little over 15 percent, and the formula appeared satisfactory. By 1960 bagasse had risen in price and was replaced by cottonseed hulls, pound for pound. The effect on nutritive content was slight.

Feeding of herd A began each year on July 20. Cattle consumed 561 pounds of the mixed feed per head annually during the 288-day feeding period (Table 2).

The herd B concentrate consisted of cottonseed cake. It was furnished mainly for its protein—41 percent—but it is also rich in phosphorus, averaging 1.2 percent (Morrison, 1949). Consumption averaged 373 pounds per head annually between November 1 and May 4 (Table 2).

During the winter feeding period, November 1 to May 4, the cottonseed cake ration supplied more than twice as much protein as the mixed feed. Cows in herd B received 155 pounds each as compared to 76 for herd A. However, the two concentrates provided similar amounts of total digestible nutrients—259 pounds per cow for herd A, 263 pounds for herd B. Table 3 lists the average nutrient composition of the supplements.

From free-choice mineral supplies, cattle in both herds annually ate 29 pounds of steamed bonemeal and 23 pounds of salt per adult animal. Hay consumption averaged 4.0 bales per head in herd A and 4.4 bales in herd B.

**TABLE 3.—Chemical Analyses of Concentrate Feeds<sup>1</sup>**

| Nutrient              | Herd A,<br>mixed ration | Herd B,<br>cottonseed cake |
|-----------------------|-------------------------|----------------------------|
|                       | Percent                 |                            |
| Crude protein         | 15.5                    | 41.5                       |
| Ether extract         | 2.3                     | 6.3                        |
| Crude fiber           | 16.1                    | 10.4                       |
| Nitrogen-free extract | 40.6                    | 28.1                       |
| Calcium               | 2.1                     | .2                         |
| Phosphorus            | 1.1                     | 1.2                        |
| Other mineral matter  | 10.1                    | 5.1                        |
| Moisture              | 12.2                    | 7.2                        |

<sup>1</sup>Based on average composition tables by Morrison (1949).

## Results

### Forage Production and Utilization

Average herbage production on the study ranges was measured at 2,167 pounds (air-dry) per acre (Table 4). Actual yield was slightly higher, because about 400 pounds of new growth per acre were destroyed by fire on the burned portions.

Utilization averaged 35 percent, and ranged from 75 percent on the burned range to 27 percent on the unburned (Table 4). Cattle usually began concentrating on the burns about 2 weeks after the fire and grazed them intensely throughout the year. Although utilization on burned range was heavy, detrimental effects, if any, were short-lived. Each year of close use was followed by 2 years of light grazing, allowing forage plants to regain any vigor they may have lost from overgrazing.

### Calf Production

Both feeding programs, in combination with improved herd and range management, markedly increased calf production. Not only were calving percentages raised far above those of the average forest range herd, but weaning weights and slaughter grades were substantially improved.

Calf crops for the 5-year period averaged 80 percent in herd A and 83 percent in herd B (Table 5). The difference is probably too small to be important. Calves in both herds averaged well over 425 pounds per head at weaning. Herd A calves were 10 pounds heavier than herd B calves (Table 6). Although weaning ages were the same for both herds—192 days—calves in herd A gained slightly faster. From early April until marketing date each year, herd A calves gained an average of 2.07 pounds per head daily, compared to 1.97 pounds for herd B.

TABLE 4.—Herbage per Acre and Degree of Utilization for Combined Ranges

| Year    | Herbage<br>(air-dry) | Utilization     |                   |                 |
|---------|----------------------|-----------------|-------------------|-----------------|
|         |                      | Burned<br>range | Unburned<br>range | Entire<br>range |
|         | Pounds               | Percent         |                   |                 |
| 1955    | 2,310                | 71              | 31                | 38              |
| 1956    | 1,836                | 94              | 27                | 35              |
| 1957    | 2,128                | 67              | 28                | 34              |
| 1958    | 2,352                | 67              | 29                | 39              |
| 1959    | 2,208                | 76              | 18                | 31              |
| Average | 2,167                | 75              | 27                | 35              |



**TABLE 5.—Calving Percentages, 1956 Through 1960**

| Year    | Herd A  | Herd B |
|---------|---------|--------|
|         | Percent |        |
| 1956    | 96      | 73     |
| 1957    | 58      | 96     |
| 1958    | 88      | 88     |
| 1959    | 84      | 76     |
| 1960    | 72      | 84     |
| Average | 80      | 83     |

**TABLE 6.—Average Weaning Weights, Ages, and Sales Price of Calves, 1956 Through 1960**

| Year    | Herd | Weaning weight | Weaning age | Sale weight | Sale price per cwt. |
|---------|------|----------------|-------------|-------------|---------------------|
|         |      | Lbs.           | Days        | Lbs.        | Dollars             |
| 1956    | A    | 415            | 186         | 399         | 15.07               |
|         | B    | 467            | 212         | 448         | 15.28               |
| 1957    | A    | 438            | 180         | 419         | 19.83               |
|         | B    | 452            | 209         | 434         | 19.91               |
| 1958    | A    | 464            | 209         | 444         | 24.85               |
|         | B    | 406            | 178         | 386         | 24.65               |
| 1959    | A    | 435            | 184         | 421         | 27.26               |
|         | B    | 420            | 187         | 408         | 28.39               |
| 1960    | A    | 465            | 200         | 455         | 21.47               |
|         | B    | 420            | 173         | 405         | 20.88               |
| Average | A    | 443            | 192         | 428         | 21.70               |
|         | B    | 433            | 192         | 416         | 21.82               |

**TABLE 7.—Average Monthly Calf Production, 1956 Through 1960**

| Month                | Proportion of calves born |        | Weaning weight |        | Weaning age |        |
|----------------------|---------------------------|--------|----------------|--------|-------------|--------|
|                      | Herd A                    | Herd B | Herd A         | Herd B | Herd A      | Herd B |
|                      | Percent                   |        | Pounds         |        | Days        |        |
| October <sup>1</sup> | 1                         | 4      | 640            | 531    | 300         | 288    |
| December             | 29                        | 29     | 510            | 514    | 237         | 239    |
| January              | 28                        | 17     | 453            | 457    | 202         | 200    |
| February             | 17                        | 22     | 419            | 407    | 171         | 173    |
| March                | 22                        | 27     | 368            | 368    | 144         | 150    |
| April                | 3                         | 1      | 316            | 300    | 122         | 108    |
| Average              | —                         | —      | 443            | 433    | 192         | 192    |

<sup>1</sup>October calves resulted from bulls breaking into range units.



**FIGURE 3.**—This heifer typifies the calves produced by mating native cows to purebred Shorthorn bulls.

Twenty-five percent of the herd A calves and 28 percent of the herd B calves were born in March and April and averaged less than 5 months at weaning (Table 7). These calves weighed less than 365 pounds at weaning, and sold for lower prices per hundredweight than the older, heavier calves. Hence, the return per head was much less than for those born in December and January.

Calves from both herds averaged high Standard in slaughter grade (Fig. 3), while calves of similar age from open-range herds graded about middle Utility. Thus, the feeding and management programs increased market value by a little over one grade.

Prices per hundred pounds of live weight were practically the same for both herds. The 5-year average was \$21.76—about \$3.00 more than for open-range calves of similar age.

Shrinkage of calves during trucking and marketing was very similar for the two herds. In herd A it averaged 15 pounds per calf, or 3.4 percent, while herd B calves shrank 17 pounds, or 3.9 percent. Distance to market was 25 miles, and calves were sold on the day of arrival.

Forty-one of the original cows—21 in herd A and 20 in herd B—remained in the herds throughout the study, permitting detailed

**TABLE 8.—Weaning Weights of Calves and Annual Production Rates of Cows by Calving Frequencies for Herds A and B Combined**

| Number of cows | Calves<br>per cow-year | Average weaning<br>weight of calves weaned | Average weight<br>per cow-year |
|----------------|------------------------|--------------------------------------------|--------------------------------|
|                | Number                 | Pounds                                     |                                |
| 1              | 0.33                   | 425                                        | 140                            |
| 1              | .40                    | 484                                        | 194                            |
| 4              | .50                    | 326                                        | 163                            |
| 11             | .60                    | 443                                        | 266                            |
| 6              | .67                    | 412                                        | 276                            |
| 1              | .75                    | 448                                        | 336                            |
| 11             | .80                    | 421                                        | 337                            |
| 26             | 1.00                   | 445                                        | 445                            |

comparisons of individual 5-year production records. Eight of the cows in herd A and 10 in herd B calved every year; their 90 calves comprised 46 percent of the total weight weaned by both herds. In addition, eight replacement cows that were in the study herds 2 years or longer calved annually, bringing to 26 the total number of cows with perfect reproduction records.

Cows with 100 percent calving records produced 282 pounds more calf weight per year than those with 50 percent calving records and nearly 170 pounds more than those with 67 percent records (Table 8). Thus, the preference often expressed by range cattlemen for cows that wean a large calf in alternate years, or 2 years out of 3, appears to be without foundation when herds are efficiently managed.

Brahman-cross cows were the most prolific, with an average calving rate of 89 percent. Non-Brahmans averaged 78 percent, and cows of predominantly Brahman breeding were lowest, averaging 70 percent.

## Costs and Returns

The price per ton of the two concentrate feeds averaged about the same. Because cottonseed cake was fed in lesser quantities, however, it cost only \$11.68 per cow-year, as compared to \$16.84 for the mixed feed. Annual expenditures for all supplemental feed (hay, mineral supplements, and concentrate), insecticides, medicines, and grazing fees averaged \$22.82 per adult animal for herd A and \$17.90 for herd B.

The principal difference between the experimental herds was in economy of calf production. Because feed expenditures were higher and calving percentage was slightly lower, herd A calves cost

TABLE 9.—Cost, Sale Price, and Return per Calf, 1956 Through 1960

| Year           | Herd | Calf crop | Cost <sup>1</sup> | Price   | Return <sup>2</sup> |
|----------------|------|-----------|-------------------|---------|---------------------|
|                |      | Percent   |                   | Dollars |                     |
| 1956           | A    | 96        | 22.34             | 60.09   | 37.75               |
|                | B    | 73        | 23.09             | 68.43   | 45.34               |
| 1957           | A    | 58        | 39.85             | 83.13   | 43.28               |
|                | B    | 96        | 18.76             | 86.39   | 67.63               |
| 1958           | A    | 88        | 27.28             | 110.36  | 83.08               |
|                | B    | 88        | 21.26             | 95.05   | 73.79               |
| 1959           | A    | 84        | 28.33             | 114.89  | 86.56               |
|                | B    | 76        | 24.16             | 115.96  | 91.80               |
| 1960           | A    | 72        | 36.36             | 97.74   | 61.38               |
|                | B    | 84        | 25.02             | 84.68   | 59.66               |
| 5-year average | A    | 80        | 30.83             | 93.24   | 62.41               |
|                | B    | 83        | 22.46             | 90.10   | 67.64               |

<sup>1</sup>Includes all costs except labor and interest on investment.

<sup>2</sup>Represents money per calf available for labor cost, interest on investment, and profit.

\$8.37 per head more to produce than herd B calves. However, as the selling price was \$3.14 per calf more in herd A, the advantage in economic return for herd B was \$5.23 per calf. Calf costs (exclusive of labor and interest) and returns are listed by years in Table 9.

### Condition of Cows

As a result of gains made on grass during the summer of 1954, cows in both herds averaged more than 700 pounds in the fall of that year—about 100 pounds more than when the study began in July (Fig. 4). Because calving percentages were low and supplements were fed, weight losses during the following winter were small. By November 1955, weight of the average cow was 907 pounds in herd A and 838 pounds in herd B. Thereafter, fall weights remained consistently high, averaging 899 pounds for herd A and 884 for herd B.

Cow weights were lowest in April. Winter losses per cow averaged 146 pounds for herd B. Herd A cows lost more—179 pounds—possibly because they were heavier in the fall and received less than half as much supplemental protein during the winter.

Weight losses during winter averaged about 200 pounds for cows that calved. This included birth weight of the calf and other



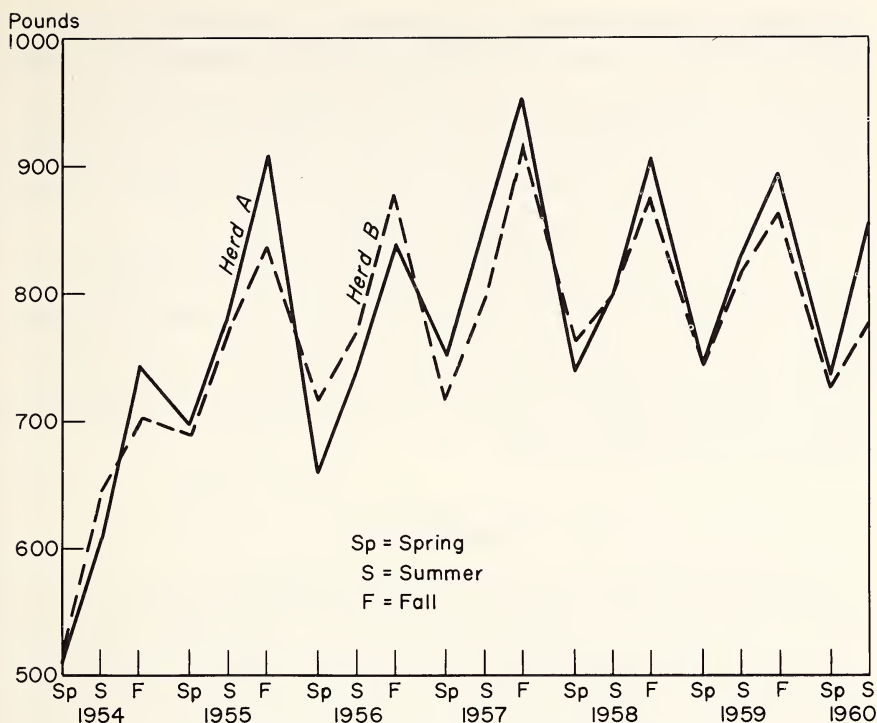


**FIGURE 4.—Average seasonal cow weights.**

losses incidental to calving. A few cows lost less than 100 pounds and some more than 300 pounds. Dry cows usually lost less than 75 pounds during winter, and a few made modest gains.

Cows that calved early lactated throughout most of the winter, when forage quality was lowest, and lost more weight than cows that calved late. In 1958, for example, calf crops for both herds were 88 percent, but herd A calves were a month older at weaning, and their dams lost 75 pounds more than the herd B cows.

Despite the nutritional demands of lactation, cows picked up weight after green grass appeared in the spring; they generally averaged 65 to 90 pounds heavier in mid-summer than in April. The cows continued gaining until November, because the calves were weaned at about the time forage quality began declining.

### Cow and Calf Mortality

There were no deaths among the adult animals in herd A. In herd B one cow was killed during Hurricane Audrey in June 1957, and two died in 1960—one from natural causes and the other prob-

ably from gunshot. Thus, annual mortality in herd B was 2.5 percent. This level is considered about normal for well-managed western range herds and well below the average for Louisiana range herds. It is especially noteworthy when age of the cows is considered. In both herds, cows averaged 9 years old when the study closed, and 27 percent of the herd A cows and 35 percent of those in herd B were 11 years or older.

During the 5-year study period, 99 calves were born alive and 4 were stillborn in herd A, while there were 107 live births and 1 stillbirth in herd B. All of the herd A calves that were born alive, and all but one in herd B, were raised to marketable age. This 0.5-percent annual calf mortality for the two herds was far below the Louisiana range herd average of over 2.5 percent reported by Campbell and Rhodes (1943).

## Discussion

While this study showed that cottonseed cake is an effective protein supplement for wintering cattle on forest range, the amount needed and the best time to begin and end feeding remain uncertain. These problems are being investigated further in a study conducted jointly by the Southern Forest Experiment Station and the Agricultural Experiment Station of Louisiana State University. Three levels of cottonseed cake feeding and three lengths of feeding period are being compared. Until the new study yields results, the herd B feeding program appears to be the wisest choice for range cattlemen.

The principal disadvantage of the herd A concentrate—its high cost—was largely due to a comparatively narrow price spread between cottonseed meal and the other ingredients. Under different price relationships, the mixed feed might be more economical than cottonseed cake. It should be noted, though, that purchase price of feed is not the only cost consideration. Because the mixed feed is required in greater quantity, storage and handling costs are higher than for cottonseed cake.

There was no evidence that vitamin A and cobalt supplements in the herd A mixed feed improved the calf crop or the condition of cows. While forage was green, range cows apparently stored sufficient vitamin A in their bodies to carry them through the winter. Other research conducted while this study was in progress showed that the principal range forage species contain ample quantities of cobalt and other trace minerals during the growing season (Duncan

and Epps, 1958). As no symptoms of trace-mineral deficiencies were noted in either herd during the study, it seems possible that winter supplies may also be adequate.

Phosphorus content of forest range herbage is deficient yearlong for pregnant or lactating cows. Steamed bonemeal, provided free-choice, satisfied phosphorus requirements during the growing season. In the winter, cottonseed meal or cake—both excellent sources of phosphorus—supplied additional quantities.

Range forage usually contains ample calcium. Steamed bonemeal averages over 30 percent calcium, however, and should correct any deficiency that might arise.

It was obvious that calves could be produced more economically if variation in market age could be reduced. Increasing the proportion of older, heavier calves while eliminating late, lightweight calves is a complex problem.

The youngest calves might be held for marketing at a later date. Their gains during late summer might prove disappointing, however, because of declining forage quality. Moreover, their dams would have little time to make post-weaning gains before frost killed back the grass. Starting the breeding season earlier and retaining the August weaning date would increase the age of all calves. While this might reduce the number of lightweight calves, it might also lower the market grade of the older calves.

Hormones or hormone-like substances to induce heat and encourage early conception may someday prove practical. At present, their effectiveness is uncertain and they are difficult to administer to range cows. Selecting replacement heifers from cows that consistently calve early might eventually reduce variation in calf age, but it is doubtful that heritability of early calving is high.

Another possibility is to reduce the length of breeding season by removing the bulls earlier—perhaps on May 1 instead of July 1—and by culling cows that fail to conceive during this shortened breeding season. This plan, in conjunction with a program of good herd management that includes adequate supplemental feed and rigid culling, appears to be the most promising.

## Summary

A test of supplemental feeding was conducted on forest range in central Louisiana from 1956 through 1960. The experimental herds each contained 25 native cows. Between July and May herd A received 561 pounds, per cow-year, of a mixed feed containing about

15 percent protein. Herd B was fed 373 pounds of cottonseed cake per cow annually between October and May. Cows in both herds received about 4 bales of hay during winter and had free access to loose salt and steamed bonemeal. Ranges were stocked yearlong at one cow per 20 acres.

During the 5 years, calf crops averaged 80 percent in herd A and 83 percent in herd B. Weaning weights at 6½ months were 443 pounds in herd A and 433 pounds in herd B. Slaughter grade averaged high Standard in both herds.

Calves from herd A sold for \$93.24 per head, those from herd B for \$90.10. Because feed costs were substantially higher for herd A, however, herd B calves returned \$5.23 more per head, exclusive of labor. Feeding required more labor for herd A than for herd B.

The study showed conclusively that cottonseed cake supplied in moderate amounts from October until May, salt and steamed bonemeal furnished free-choice yearlong, and a small amount of hay fed in late winter permit efficient, profitable beef production on forest ranges. This feeding program, together with good herd and range management, resulted in calf production far above the average for forest range cattle.

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# **MOTIVATIONS in CONSUMER PURCHASES of BEEF**

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## Southern Regional Research Project SM 19

This report contains findings from a study that is a contributing project to Southern Regional Research Project SM 19, "Motivational Factors in Consumer Purchases of Beef as Related to Objective Measurements Used to Predict Beef Acceptability." This study relates to the objective "To Determine and Appraise the Motivation Factors that Affect Consumers in Their Purchase of Beef," on which the Agricultural Experiment Stations of Alabama, Georgia, and Texas also have projects.



# Motivations in Consumer Purchases of Beef

BETTY L. WOODS<sup>1</sup> AND MARTHA C. JENKINS<sup>2</sup>

Consumer satisfaction with beef that has been selected in the market and prepared and served at home is of prime concern to the livestock breeder and feeder, and to the processor or retailer.

Optimum eating satisfaction to the consumer and reasonable returns for the producer-handler are mutually rewarding to each group. The accomplishment of both goals is necessary to assure complete satisfaction for both producer and consumer. The rapidly expanding population and the increasing per capita consumption of beef certainly point out a need for a better understanding of the requirements of each group in order to facilitate reaching these goals.

This study attempts to determine and appraise the motivations that influence consumers when they purchase beef. Since the homemaker usually buys the beef for the family, or directs its purchase through earlier decisions concerning menus, her reasons for selection are important. The "whys" of her decisions should serve as guides to the producer and the retailer as well as the advertiser.

Many factors influence the consumer's decisions in the purchase of beef. Often she can enumerate these factors easily. In some cases the consumer may not be aware of the actual motivations or may have difficulty in verbalizing them. For these reasons, the schedule used in this study included direct, indirect, and projective-type questions. The projective methods used were cartoons and hypothetical situations. Most of the data obtained from the "situation" questions were reported in an earlier bulletin.<sup>3</sup>

## Procedure

A survey was made in the spring of 1960 of 588 families in Shreveport, Lake Charles, and Monroe, three of Louisiana's largest cities excluding New Orleans and Baton Rouge. The sample was randomly drawn from households listed in Polk's City Street Directory of each city. To reduce travel time between sample households, the sample elements were drawn in clusters of five. See Table 1 for the number of households in each city.

In each city, interviewers were hired and trained by the Home Economics Marketing Research staff. House-to-house interviews were conducted and data were obtained from the homemaker or the person responsible for purchasing the meat. Interviewers made at least four attempts to contact the sample household before an alternate was taken.

The schedule was finalized after a review of the results of two pilot

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<sup>3</sup>Woods, Betty, and Ganata Jo Nettles, *Status of Meats as Interpreted From Meal Situations*, Louisiana Agricultural Experiment Station Bulletin 557, October, 1962.

TABLE 1.—Population of Sample by City

| City         | Population | Number<br>in sample |
|--------------|------------|---------------------|
| Lake Charles | 89,115     | 180                 |
| Monroe       | 80,546     | 212                 |
| Shreveport   | 208,583    | 196                 |
| Total        | 378,244    | 588                 |

studies, one of which included 100 families randomly sampled from households in Baton Rouge. The schedule included direct questions, indirect questions, and cartoons and situations which were projective in nature. The projective techniques used were designed with the aim of obtaining attitudes and feelings toward beef and marketing practices that might not have been verbalized by the respondents. The Appendix includes one cartoon representative of those included in the questionnaire (Appendix Form 1).

Data from the schedules were edited, coded, and punched into IBM cards. Summary tables were made from the answer sheets. These data were then analyzed by the Home Economics Marketing Research staff.

## Summary of Findings

Respondents reported through structured questions that they considered cost the most important factor in selecting beef. The amount, color, and texture of the lean, and the USDA grade and/or USDA inspection stamp ranked almost as high in importance. General appearance of the cut and the nutritive value of the meat were listed often as factors influencing choices.

More white than non-white respondents listed USDA grade and/or USDA inspection stamp as a motivating factor. USDA grade and/or USDA inspection stamp and the cost of beef were considered more often by families with very low and high incomes than by those in the middle income groups. Homemakers with elementary education and those with graduate training considered cost of beef more often than did those with high school training.

In response to projective questions of why homemakers bought various cuts of beef, economy or cost again ranked first. The expected flavor and the versatility of the cut rated second and third, respectively, in reasons for buying. Other reasons listed often were ease of preparation, family preference, and expected tenderness.

As reasons for buying round steak, economy, expected flavor, and cut for a special purpose were listed most often. By far the most popular reason listed for selecting rib roast was expected flavor. Next in importance was expected tenderness. Versatility and economy were reasons given by almost one-half of all respondents for purchasing ground beef. Economy was listed most often as a reason for buying chuck pot roast. The second most important reason was expected flavor.

## **Respondents' Guides for Predicting Tenderness**

The color of beef was the indication of tenderness most often relied upon by consumers. The grain or texture of the lean and amount of fat were second and third place factors. Three times as many white as non-white respondents listed either outside fat or marbling as an indication of tenderness. As the education of the homemaker increased, so did the percentage of respondents who listed large amount of fat and marbling as indications of tenderness. Flavor or taste was given most often as a reason for buying beef with outside fat.

## **Shopping Habits of Respondents**

More than half of the respondents reported that husbands sometimes shopped with them. Forty-two percent of the respondents indicated that husbands sometimes shopped alone. Husbands of younger homemakers took a more active part in the purchase of meat than did those of older homemakers.

One-half of the families made meat purchases about once a week. Families in the high income level made more frequent meat purchases than did any other group. Slightly more respondents decided what meat to purchase before getting to the store than after arriving at the store (54 and 44 percent). Husbands who were younger took a more active part in deciding what meat would be served.

Reasons given most frequently for purchasing meat at a certain store were quality of meat, economy, and convenience of location. The percentage of families who listed quality of the meat increased as family income increased. Generally, as the occupational level of the husbands increased, the percentage who listed quality and economy as reasons for buying meat at a certain store increased.

## **Sources of Help in Learning to Select Beef**

In learning to select beef at least half of the respondents replied that trial and error or experience was the best teacher. Family and friends and the butcher rated high in the list of sources of help. Many homemakers indicated that their husbands taught them a great deal about selecting beef.

As the educational level of the husband increased, the percentage of homemakers listing the husband as helpful in learning to select beef increased. Television as a source of help decreased as the husband's educational level increased.

As the homemaker's education increased, the number of respondents who listed home economics classes and newspapers and magazines increased, and those listing trial and error decreased.

More respondents listed television, cookbooks, and home economics classes as sources of help in structured questions than in projective questions.

## Description of Families

The sample was composed of 588 households, of which 212 were located in Monroe, 196 in Shreveport, and 180 in Lake Charles. Individual families represented a wide range in income, educational level, occupation, and level-of-living.

Forty-seven percent of the families studied reported an annual income of less than \$4,000. An annual income of \$4,000 to \$8,000 was reported by 36 percent of the total families. Only 17 percent of the families were classified in the high income group (\$8,000 and over). The median family income for the state is \$4,272, according to the U. S. Census Bureau, *Statistical Abstract of United States 1961*.

The husbands' levels of education were divided into three categories: (1) none or elementary, (2) high school, and (3) college and other. Thirty-two percent of the respondents had husbands in the high school group. Twenty-six percent of the respondents had husbands who had an elementary education, while 24 percent had college training.

The educational levels of the homemakers were grouped in the same manner as those of the husbands. The pattern of distribution was also the same, with the larger percentage (49) of the homemakers being in the high school group. The elementary group ranked second with 27 percent and the college group was third with 23 percent.

The husbands' occupations were categorized into five groups. The professional group included professional, technical, managers, and kindred workers. The next group, clerical, was composed of clerical, sales, and kindred workers. The skilled category included craftsmen, foremen, operative, and kindred workers. Service workers and laborers were grouped as service. The final group, unemployed, included those who were unemployed or retired. Of these groups, 26 percent of the husbands held professional positions, while 26 percent were skilled workers. Twelve percent were service workers, 7 percent clerical workers, and 8 percent unemployed.

The majority of the women were full-time homemakers—69 percent responded that they did not work for pay outside the home. Approximately one-fourth of those who worked outside the home were employed part time. Almost two-thirds of the families owned their homes. The majority of the homes, about 70 percent, ranged in size from four through six rooms.

The level-of-living score for each respondent was obtained from a list of goods and services available in the respondent's home. The items included certain household appliances, maid service, heating and cooling systems, etc. Respondents were given 1 point for each item owned, except for central heating and central air conditioning systems, which rated 2 and 4 points, respectively. If the respondents owned two or more of any one item, they received 2 points for that category. Although the total possible level-of-living score was 20, most of the respondents



TABLE 2.—Demographic Data of Families in Sample

| Classification                | Number | Percent* | Classification                          | Number | Percent* |
|-------------------------------|--------|----------|-----------------------------------------|--------|----------|
| <b>Race</b>                   |        |          | <b>Homemaker's Employment Schedule</b>  |        |          |
| White                         | 427    | 72.6     | Full-time employed                      | 133    | 22.6     |
| Non-white                     | 161    | 27.4     | Part-time employed                      | 41     | 6.9      |
|                               |        |          | Full-time homemaker                     | 406    | 69.1     |
| <b>Family Income</b>          |        |          | No answer                               | 8      | 1.4      |
| Under \$3,999                 | 278    | 47.1     | <b>Occupation of Homemaker</b>          |        |          |
| \$4,000 through \$5,999       | 125    | 21.3     | Unskilled                               | 74     | 12.6     |
| \$6,000 and over              | 182    | 31.0     | Clerical                                | 53     | 9.0      |
| No answer or don't know       | 3      | 0.3      | Professional                            | 45     | 7.7      |
|                               |        |          | Homemaker                               | 406    | 69.0     |
| <b>Occupation of Husband</b>  |        |          | No answer                               | 10     | 1.7      |
| Professional                  | 153    | 26.0     | <b>Area in Which Respondent Grew Up</b> |        |          |
| Clerical                      | 39     | 6.7      | Louisiana                               | 408    | 69.4     |
| Skilled                       | 151    | 25.7     | Other southern states                   | 113    | 19.2     |
| Service                       | 72     | 12.2     | Other                                   | 66     | 11.2     |
| Unemployed                    | 52     | 8.8      | No answer                               | 1      | 0.2      |
| No husband                    | 119    | 20.2     | <b>Number of Persons in House</b>       |        |          |
| No answer                     | 2      | 0.3      | One                                     | 61     | 10.4     |
|                               |        |          | Two                                     | 160    | 27.2     |
| <b>Education of Husband</b>   |        |          | Three to five                           | 289    | 49.1     |
| Elementary                    | 151    | 25.7     | Six or more                             | 76     | 13.0     |
| High school                   | 185    | 31.5     | No answer                               | 2      | 0.3      |
| College                       | 142    | 24.2     | <b>Years in Louisiana</b>               |        |          |
| No husband in house           | 100    | 17.0     | Less than one                           | 20     | 3.4      |
| No answer or don't know       | 10     | 1.8      | One to five                             | 47     | 8.0      |
|                               |        |          | Six to ten                              | 18     | 3.1      |
| <b>Level-of-Living Score</b>  |        |          | More than ten                           | 494    | 84.0     |
| 0 to 2                        | 89     | 15.2     | No answer                               | 9      | 1.5      |
| 3 to 5                        | 248    | 42.2     | <b>Home Ownership</b>                   |        |          |
| 6 to 8                        | 148    | 25.2     | Owned                                   | 369    | 62.8     |
| 9 to 11                       | 66     | 11.1     | Rented                                  | 210    | 35.7     |
| 12 to 18                      | 37     | 6.2      | Other                                   | 9      | 1.5      |
|                               |        |          | <b>Family Religion</b>                  |        |          |
| <b>Education of Homemaker</b> |        |          | Protestant                              | 466    | 79.3     |
| Elementary                    | 156    | 26.6     | Catholic                                | 90     | 15.3     |
| High school                   | 288    | 49.0     | Catholic and Protestant                 | 21     | 3.6      |
| College                       | 137    | 23.3     | Jewish                                  | 6      | 1.0      |
| No wife in house              | 5      | 0.9      | Other                                   | 4      | 0.7      |
| No answer or don't know       | 2      | 0.4      | No answer                               | 1      | 0.2      |
|                               |        |          | <b>Home Freezer</b>                     |        |          |
| <b>Age of Husband</b>         |        |          | No                                      | 448    | 76.2     |
| Under 30 years                | 69     | 11.7     | Yes                                     | 140    | 23.8     |
| 30 to 50 years                | 252    | 42.8     |                                         |        |          |
| 50 and over                   | 139    | 23.7     |                                         |        |          |
| No answer                     | 128    | 21.7     |                                         |        |          |
|                               |        |          |                                         |        |          |
| <b>Age of Homemaker</b>       |        |          |                                         |        |          |
| Under 30 years                | 121    | 20.5     |                                         |        |          |
| 30 to 50 years                | 281    | 47.8     |                                         |        |          |
| 50 and over                   | 168    | 28.6     |                                         |        |          |
| No answer                     | 18     | 3.1      |                                         |        |          |

\*Percents for each total 100.

scored from 3 through 6. At least one television set, bathroom, and telephone were reported by the majority of the families; about one-half had at least one automobile; and families having central air conditioning, maid service, central heating, home freezers, and air conditioning units were definitely in the minority.

The average family interviewed in this sample was composed of 3.4 persons, which compares closely with that of the state as a whole—3.57, as reported by the U. S. Census Bureau, *Statistical Abstract of United States 1961*. Almost 50 percent of the homemakers and about 43 percent of the husbands were between 30 and 50 years of age. Almost 21 percent of the homemakers reported no husband.

Respondents who had grown up in Louisiana (48 percent in North Louisiana and 22 percent in South Louisiana) represented about 70 percent of the total sample. Almost 20 percent had grown up in another southern state. Most of the respondents had lived in Louisiana more than 10 years.

When grouped according to race, about 73 percent of the respondents were white and 27 percent were non-white. According to the 1960 census of the population of the state, 67.9 percent of the persons in Louisiana were white and 32.1 percent were non-white. The predominant religion of the respondents was Protestant, accounting for 79 percent of all families. Slightly over 15 percent were Roman Catholic, and most of the remaining families were Jewish or reported mixed marriages (Table 2).

## **General Motivations in Purchasing Beef**

Many factors influence the consumer in her purchase of beef as well as other meats. Sometimes the consumer may not be aware of these factors or their relative influence on her decisions. In one question, respondents were asked to select, from a set of structured answers, the most important factors in the purchase of beef; in another, projective-type questions in the form of cartoons were asked about specific beef cuts (Appendix Form 1).

### **Motivations Interpreted From Structured Answers**

The structured answers arranged for the respondents to check were derived from a list of factors influencing the purchase of beef reported by respondents interviewed in two earlier pilot studies.\* Handcards were made from this list of factors mentioned most often as influencing the purchase of beef. Respondents in the present study were each given a set of handcards. They were asked to choose six factors most important in their own selection of beef and to arrange the factors in the order of importance.

The factor chosen most often (18 percent) as being first in importance

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\*Unpublished data, School of Home Economics, Louisiana State University.

in the purchase of beef was USDA grade and/or USDA inspection stamp. Next came cost of beef, and general appearance of cut, accounting for 16 and 12 percent, respectively, of the respondents. Slightly more than 8 percent listed "nutritive value or fits diet" as being most important and about the same percentage gave amount, color, and texture of lean. Less than 6 percent of the respondents listed any other single factor as being most important, indicating that the factors enumerated here in fact represent the major influences in consumer decision-making.

The factor chosen most often as being second in importance in the purchase of beef was also chosen most often as being third in importance. This factor, amount, color, and texture of lean, was listed in second place by 11 percent of the respondents and in third place by 13 percent. Other second place factors in order of importance according to frequency of listing were USDA grade and/or USDA inspection stamp, general appearance of cut, nutritive value, cost of beef, amount and color of outside fat, and amount of marbling.

Other third place factors were cost of beef, general appearance of cut, amount and color of outside fat, amount of bone, and "cut can be used for more than one meal." Other single factors were mentioned by less than 7 percent of respondents (Table 3).

**TABLE 3—Most Important Factors That Influence Their Purchase of Beef as Reported by Respondents**

| Factor                                   | Reported as the       |                              |                             |
|------------------------------------------|-----------------------|------------------------------|-----------------------------|
|                                          | Most important factor | Second most important factor | Third most important factor |
|                                          |                       | Percent                      |                             |
| USDA grade and/or USDA inspection stamp  | 18.4                  | 8.7                          | 6.5                         |
| Cost of beef                             | 16.0                  | 7.8                          | 8.8                         |
| General appearance of cut                | 11.9                  | 8.3                          | 8.3                         |
| Nutritive value                          | 8.3                   | 8.3                          | 4.4                         |
| Amount, color, and texture of lean       | 8.2                   | 11.2                         | 13.3                        |
| Habits of family                         | 5.1                   | 2.4                          | 3.1                         |
| Favorite food of a member of the family  | 4.4                   | 5.1                          | 4.8                         |
| Amount of bone                           | 3.6                   | 7.0                          | 7.8                         |
| Amount and color of outside fat          | 3.2                   | 7.5                          | 8.2                         |
| Amount of marbling                       | 2.9                   | 7.3                          | 4.4                         |
| Quickness of preparation                 | 2.7                   | 3.2                          | 2.4                         |
| Cut can be used for more than one meal   | 2.6                   | 5.6                          | 7.5                         |
| Ease of preparation                      | 2.2                   | 2.2                          | 4.4                         |
| Suitability of cut for method of cooking | 2.0                   | 2.0                          | 1.9                         |
| Cut can be prepared in different ways    | 1.9                   | 3.4                          | 5.4                         |
| Special occasion                         | 1.9                   | 3.4                          | 1.4                         |
| Variety in meals                         | 1.9                   | 2.7                          | 3.7                         |
| Available in store                       | 1.9                   | 2.4                          | 2.4                         |
| Religious customs                        | 0.7                   | 0.9                          | 0.9                         |
| No answer                                | 0.3                   | 0.5                          | 0.5                         |
| Total                                    | 100.1                 | 99.9                         | 100.1                       |

There was considerable difference of opinion among consumers as to which factors were most important in the selection of beef and as to their order of importance. Thus, a weighted score was calculated from all answers in order to evaluate more clearly the importance assigned each factor by the respondents. The weighted score was computed by multiplying the percentages for the first choice factors by six, second choice factors by five, third choice factors by four, fourth choice factors by three, fifth choice factors by two, and sixth choice factors by one; adding the weighted choices for each factor; and rounding to the nearest whole number.

When the weighted factors were ranked from most important to least important, the first, second, third, and fourth place unweighted factors were among the top six weighted factors, but the order was somewhat different. The first, second, and third place weighted factors—cost of beef, amount, color, and texture of lean, and USDA grade and/or USDA inspection stamp—were almost equally important with scores 215, 209, and 204, respectively. General appearance of cut was fourth, nutritive value or fits diet, fifth, and amount of bone, sixth. The fifth and sixth place unweighted factors, both of which pertain to the versatility of the cut, dropped to eighth and eleventh, respectively, when weighted (Table 4).

**TABLE 4.—Weighted Score for Factors That Influence the Purchase of Beef**

| Factor                                   | Score |
|------------------------------------------|-------|
| Cost of beef                             | 215   |
| Amount, color, and texture of lean       | 209   |
| USDA grade and/or USDA inspection stamp  | 204   |
| General appearance of cut                | 184   |
| Nutritious or fits diet                  | 141   |
| Amount of bone                           | 136   |
| Amount and color of outside fat          | 128   |
| Cut can be used for more than one meal   | 120   |
| Favorite food of a member of family      | 103   |
| Amount of marbling                       | 100   |
| Cut can be prepared in different ways    | 91    |
| Variety in meals                         | 79    |
| Quickness of preparation                 | 72    |
| Habits of family                         | 71    |
| Suitability of cut for method of cooking | 63    |
| Ease of preparation                      | 58    |
| Special occasion                         | 48    |
| Available in store                       | 53    |
| Religious customs                        | 16    |
| No answer                                | 11    |

**The Influence of Demographic Factors**—The *racial background* of the respondents appeared to be associated with the choice of the most important factor in purchasing beef. More white than non-white respondents listed USDA grade and/or USDA inspection stamp, while more non-white respondents listed cost of beef. Slightly more importance



was attached to general appearance of cut, nutritive value or fits diet, and habits of family by whites; non-whites were somewhat more aware of amount of bone as a factor in purchasing.

Certain characteristics of families strongly influence their decision as to the most important factor in their purchase of beef. Differences due to *income* level were highly significant (Chi-square test). USDA grade and/or USDA inspection stamp was listed more often than other factors as being most important by respondents from families whose yearly income ranged from \$2,000 to \$8,000 and also by those from families with an income of \$10,000 or more. Cost of beef was listed most often by those from families having an annual income under \$2,000 and those in the \$8,000 to \$10,000 group. It is interesting to note that in all income groups these two factors were either first or a close second.

The *occupation of the husband* seemed to influence the motivation factors to some extent. More families in the clerical group listed USDA grade and/or USDA inspection stamp than any other group, with the skilled worker group second. About the same percentage of all groups reported that the cost of beef influenced their purchase. General appearance of the cut was listed most often by the skilled and professional groups and least often by the clerical group. The service group mentioned more often than other groups "cut can be used for more than one meal," "cut suited to the method of preparation planned" and "cut can be prepared in different ways." The unemployed and retired group listed most often quickness of preparation, ease of preparation, and variety in meals.

As the *level-of-living* score increased, the percentage suggesting cost of beef and quickness of preparation increased, except for the highest income group. As the score increased, the "nutritive value of beef" increased generally. Appearance of the meat and USDA grade and/or USDA inspection stamp were included often by all groups except the lowest group (0-2 items). Amount of bone and amount and color of fat decreased as level-of-living items increased.

The *educational level of the homemaker* made a significant difference in responses. Homemakers classified in the elementary school and graduate school groups considered cost of beef somewhat more important than other factors, while those in the high school and college groups attached more importance to USDA grade and/or USDA inspection stamp and general appearance of the cut. If the *husband* had either high school, college, or graduate school training, USDA grade and/or USDA inspection stamp was considered first in importance while cost of beef and general appearance of cut were second and third, respectively. The reverse of this was true if he had an elementary school education. The college group for both husbands and homemakers attached more importance to nutritive value than did other groups.

The *occupation of the homemaker* seemed to have some influence on beef purchasing practices. More homemakers employed in unskilled posi-

tions indicated that general appearance of the cut should be given prime consideration in the purchase of beef, while more importance was attached to USDA grade and/or USDA inspection stamp by clerical and professional workers and more to cost of beef by homemakers who did not work outside the home. Workers in the clerical category, both homemakers and husbands, listed nutritive value more often than did those in other occupational groups. If the homemaker worked full time outside the home, regardless of occupation type, she placed most emphasis on USDA grade and/or USDA stamp; if she was employed part time, slightly more emphasis was placed on general appearance of cut; and if she did not work outside the home at all, cost of beef was mentioned slightly more often than other factors.

## Motivations Interpreted From Projective Answers

Respondents were presented cartoons depicting a consumer in the process of deciding why she purchased certain cuts of beef. The respondent was free to list any number of reasons for purchasing round steak, rib roast, ground beef, and chuck pot roast without the help of structured answers or suggestions from the interviewer.

When the reasons for purchasing round steak, rib roast, ground beef, and chuck pot roast were combined, the respondents listed economy most often; flavor or good taste was the second over-all reason given by the respondents for purchasing these specific cuts. Versatility, cut for special preparation, and ease of preparation also ranked high among the reasons indicated. Certain factors, notably "small amount of bone," "large amount of lean, little waste," and "no bone, no waste, all meat," appear to relate directly to "economy." When the percentages listing these factors are combined, economy, with 39 percent, far outweighs other factors (Table 5).

**Reasons for Purchasing Round Steak**—Apparently the consumer sees the round steak as a tasty, versatile and, above all, an economical cut of beef. This was evidenced by the fact that "economy," "like flavor or good taste," and "cut of meat for special purpose" were listed by 27, 22, and 17 percent, respectively, of all respondents in the survey as reasons for buying round steak. The two factors mentioned next most often—"small amount of bone" (15 percent) and "large amount of lean, little waste" (15 percent)—relate closely to "economy." Almost 9 percent of the respondents listed "family preference." Other individual factors were mentioned by less than 6 percent of the respondents.

When reasons given for purchasing round steak were broken down by certain personal data characteristics of the families, it was noted that:

(1) "Economy" was listed either first or second most often by families in every *income* group and in every *educational-level-of-husband* group. The percentage was slightly higher if the husband had attended graduate school. It was listed more often than any other factor by every *educational-level-of-homemaker* group except elementary and by every

**TABLE 5.—Total Reasons for Purchasing Certain Cuts of Beef (Round Steak, Rib Roast, Ground Beef, Chuck Roast)**

| Reason                             | Number | Percent* |
|------------------------------------|--------|----------|
| Economy or cost                    | 657    | 27.9     |
| The flavor or good taste           | 519    | 22.1     |
| Versatility                        | 306    | 13.0     |
| Cut for special preparation        | 329    | 14.0     |
| Ease of preparation                | 219    | 9.3      |
| Family preference                  | 199    | 8.5      |
| Expected tenderness                | 148    | 6.3      |
| Small amount of bone               | 120    | 5.1      |
| Large amount of lean, little waste | 85     | 3.6      |
| Nutritious                         | 58     | 2.5      |
| No bone, no waste, all meat        | 52     | 2.2      |
| Quickness of preparation           | 48     | 2.0      |
| Variety or a change                | 40     | 1.7      |
| Better grade of meat               | 39     | 1.6      |
| Appearance of meat                 | 34     | 1.4      |
| Juiciness                          | 32     | 1.4      |
| Small amount of fat                | 17     | 0.7      |
| Right amount of fat                | 12     | 0.5      |
| Good cut of beef                   | 7      | 0.3      |
| Don't buy                          | 395    | 16.8     |
| Other reasons                      | 87     | 3.7      |
| Don't know                         | 47     | 2.0      |
| No answer                          | 1      | 0.04     |

\*Percents total more than 100 because of multiple responses.

*occupation-of-homemaker* group except unskilled. Homemakers employed outside the home full time agreed with those who did not work away from home that economy was the top motivating factor in purchasing round steak. More white respondents than non-white mentioned economy in purchasing round steak.

Other factors of note relate closely to economy. Respondents with an annual income under \$2,000 listed "no bone" more often than any other factor as a reason for purchasing round steak. "Small amount of bone" was mentioned more often by respondents whose annual income was between \$2,000 and \$4,000 than by other income groups (from about 20 percent more than the under-\$2,000 group down to about 8 percent for other groups).

(2) "Good flavor" or "good taste" was listed often by homemakers with only an elementary school education, those employed in unskilled occupations, and those employed only part time. This was also the top motivating factor listed by non-white respondents; they gave this factor as a reason for purchasing round steak about 13 percent more often than did white respondents.

(3) "Cut of meat for special purpose" was not the top reason for purchasing round steak but it was high on the list and received more emphasis from some groups than others.

(4) About 14 percent of the respondents indicated that they did not buy round steak (Table 6).

**Reasons for Purchasing Rib Roast**—By far the most popular reasons for selecting rib roast were flavor or good taste (27 percent) and expected tenderness (16 percent), as one would normally expect. Next in importance were economy and juiciness. No other factor was listed by more than 5 percent of the respondents. A large proportion of this sample (44 percent) reported they either did not purchase rib roast or did not know why they did so (Table 6).

When answers were classified according to personal data characteristics of families, very few differences were noted. Flavor and good taste, and expected tenderness were almost invariably the reasons given most frequently regardless of personal data breakdown. The higher educational groups for both husband and homemaker gave somewhat more emphasis to economy than other educational groups. Professionally employed homemakers listed better cut or grade of meat twice as often as unemployed homemakers and three to four times as often as homemakers otherwise employed. Expected tenderness, economy, juiciness, better cut or grade of meat, and family preference were all mentioned slightly more often by white than non-white respondents as reasons for selecting rib roast.

**Reasons for Purchasing Ground Beef**—Versatility and economy were reasons given by almost one-half (44 and 40 percent, respectively) of all respondents for purchasing ground beef. "Cut for special preparation" was listed by exactly one-fourth. Family preference and ease of preparation rated next as reasons for purchasing ground beef. The only other factors mentioned by more than 5 percent were flavor or good taste and quickness of preparation (Table 6).

Classification of answers according to personal data characteristics in most cases revealed the same ranking of reasons for purchasing ground beef as did the totals. A few differences were noted. Flavor or good taste was the top reason listed by homemakers employed in clerical positions and was given considerable emphasis by respondents with an annual family income of \$2,000 to \$4,000 and by homemakers with only elementary school education. More non-white respondents also gave this reason for their choice.

Homemakers employed full time and those employed in clerical positions attached more importance to ease of preparation than did homemakers with graduate school education, who mentioned quickness more often.

**Reasons for Purchasing Chuck Pot Roast**—The main reason given by consumers interviewed in this study for buying chuck pot roast was economy. This reason was given by 38 percent of the respondents. Almost as important was flavor or good taste, listed by 31 percent. Ease of preparation was mentioned by 17 percent, cut for special preparation



TABLE 6.—Reasons for Purchasing Various Cuts of Beef

| Reason                             | Round steak |          | Rib roast |          | Chuck pot roast |          | Ground beef |          |
|------------------------------------|-------------|----------|-----------|----------|-----------------|----------|-------------|----------|
|                                    | Number      | Percent* | Number    | Percent* | Number          | Percent* | Number      | Percent* |
| Economy or cost                    | 158         | 26.9     | 39        | 6.6      | 225             | 38.3     | 235         | 40.0     |
| Like flavor or good taste          | 131         | 22.3     | 161       | 27.4     | 181             | 30.8     | 46          | 7.8      |
| Cut for special preparation        | 102         | 17.3     | 26        | 4.4      | 54              | 9.2      | 147         | 25.0     |
| Small amount of bone               | 89          | 15.1     | 18        | 3.1      | 13              | 2.2      |             |          |
| Large amount of lean, little waste | 85          | 14.5     |           |          |                 |          |             |          |
| Family preference                  | 51          | 8.7      | 25        | 4.3      | 31              | 5.3      | 92          | 15.6     |
| Versatility                        | 34          | 5.8      | 2         | 0.3      | 12              | 2.0      | 258         | 43.9     |
| Expected tenderness                | 33          | 5.6      | 91        | 15.5     | 24              | 4.1      |             |          |
| No bone, no waste, all meat        | 33          | 5.7      |           |          |                 |          | 19          | 3.2      |
| Ease of preparation                | 24          | 4.1      | 14        | 2.4      | 97              | 16.5     | 84          | 14.3     |
| Nutritious                         | 15          | 2.6      | 7         | 1.2      | 21              | 3.6      | 15          | 2.6      |
| Better grade of meat               | 14          | 2.4      | 24        | 4.1      | 1               | 0.2      |             |          |
| Good cut of beef                   | 7           | 1.2      |           |          |                 |          |             |          |
| For variety or change              | 7           | 1.2      | 11        | 1.9      | 8               | 1.4      | 14          | 2.4      |
| Quickness                          | 6           | 1.0      | 3         | 0.5      | 3               | 0.5      | 36          | 6.1      |
| Appearance of meat                 | 4           | 0.7      | 10        | 1.7      | 2               | 0.3      | 18          | 3.1      |
| Right amount of fat                | 4           | 0.7      | 8         | 1.4      |                 |          |             |          |
| Small amount of fat                |             |          | 7         | 1.2      | 10              | 1.7      |             |          |
| Juiciness                          |             |          | 32        | 5.4      |                 |          |             |          |
| Don't know                         | 15          | 2.6      |           |          | 9               | 1.5      |             |          |
| Don't buy                          | 83          | 14.1     | 23        | 3.9      | 68              | 11.2     | 8           | 1.4      |
| Other reasons                      | 2           | 0.3      | 236       | 40.1     | 20              | 3.4      | 32          | 5.5      |
| No answer                          | 1           | 0.1      | 33        | 9.2      |                 |          |             |          |

\*Percents total more than 100 because of multiple responses.

by 9 percent, and family preference by 5 percent. Only 11 percent of the respondents indicated that they did not buy chuck pot roast (Table 6).

When answers were classified into personal data groups, a few differences were noted. One of the most important reasons in almost every group was flavor or good taste. Another popular reason, ease of preparation, was listed almost twice as often by white as by non-white respondents.

Homemakers who worked part time listed family preference as a reason for buying chuck pot roast more than twice as often as did the full-time workers. Homemakers who had attended graduate school gave nutritive value as their reason for this purchase more often than did homemakers with less formal education. Versatility appeared more often as a reason for buying chuck pot roast in answers of respondents whose husbands had college educations (30 percent).

## Respondents' Guides for Predicting Tenderness in Beef

The relative importance beef purchasers attach to tenderness and their method of evaluating a retail cut in predicting tenderness are of major concern to persons interested in the production and the consumption of beef. Not only the factors that actually determine tenderness, but the guides that the consumer presently uses to predict tenderness are important.

From a projective question, respondents reported that color was the factor relied upon most often to indicate tenderness in beef. Almost half

TABLE 7.—Respondents' Guides for Predicting Tenderness in Beef

| Guide for tenderness      | Number | Percent* |
|---------------------------|--------|----------|
| Color                     | 282    | 48.0     |
| Light or bright red       | 26.0%  |          |
| Color in general          | 12.4%  |          |
| Dark red                  | 9.5%   |          |
| Total                     | 47.9%  |          |
| Fine grain or texture     | 138    | 23.5     |
| Marbling                  | 93     | 15.8     |
| Choice cut of meat        | 88     | 15.0     |
| Small amount of fat       | 64     | 10.9     |
| Top or high grade of meat | 47     | 8.0      |
| Large amount of fat       | 38     | 6.5      |
| Color of fat              | 37     | 6.3      |
| Fresh, moist appearance   | 31     | 5.3      |
| Firm, not hard appearance | 20     | 3.4      |
| Cut across grain          | 17     | 2.9      |
| Bone in meat              | 13     | 2.2      |
| Small size of cut         | 10     | 1.7      |
| High cost                 | 5      | 0.9      |
| Miscellaneous             | 41     | 7.0      |
| Don't know                | 66     | 11.2     |

\*Percents total more than 100 because of multiple responses.

(48 percent) of all respondents mentioned color in some way. Twenty-six percent suggested light or bright red; 12 percent suggested color in general; 10 percent reported medium or dark color.

The grain or texture of the meat was the second most important indicator—24 percent of the respondents listed this factor.

The amount of fat was the third ranking guide. Sixteen percent of the respondents mentioned marbling as an indicator of tenderness; nearly 7 percent listed a large amount of outside fat; 6 percent suggested the color of the fat. Conversely, almost 11 percent reported that a small amount of fat indicated tenderness. Other factors mentioned were: grade (high or top grade), fresh or moist appearance, and firm but not hard appearance. Perhaps of more importance, 11 percent of all respondents reported they did not know how to detect tenderness in beef (Table 7).

## Respondents' Opinions of Outside Fat and Tenderness

An analysis of the respondents' opinions concerning the relationships of outside fat to tenderness revealed that 83 percent of the respondents felt that one should buy beef with outside fat; almost 16 percent said "no." The remaining 1 percent did not know or did not answer.

But when asked their reasons for buying beef with fat, flavor or taste ranked first, with 64 percent of families listing this reason, and only 24 percent of the respondents replied that it indicated tenderness. Other reasons for buying beef with outside fat were juiciness, as an indication of quality, and easier to prepare (Table 8).

TABLE 8.—Reasons for Purchasing Beef With Outside Fat

| Reason                     | Number | Percent* |
|----------------------------|--------|----------|
| Flavor, taste              | 314    | 64.3     |
| Tenderness                 | 117    | 24.0     |
| Juiciness                  | 88     | 18.0     |
| Indication of quality meat | 53     | 10.9     |
| Easier to prepare          | 48     | 9.8      |
| To make gravy              | 19     | 3.9      |
| Other                      | 21     | 4.3      |
| Don't know                 | 13     | 2.7      |

\*Percents based on 488 respondents who indicated that they bought beef with outside fat. Percents total more than 100 because of multiple responses.

## The Influence of Family Characteristics

In a further analysis of the indications of tender beef, *race* seemed to account for some differences. Three times as many white as non-white respondents listed fat (outside and/or marbling) as an indicator of tenderness. Interestingly, however, a larger percentage of whites than non-whites mentioned a small amount of fat as indicating tenderness. Little difference due to race was noted in the association of color or texture with tenderness.

As *income* increased from low (under \$2,000 to \$4,000), to medium (\$4,000 to \$6,000), to high (\$6,000 and up), more respondents associated marbling with tenderness in the selection of beef. The same was true for respondents who reported a large amount of fat as an indication of tenderness and for those who recommended buying beef with fat. As the income increased, so did the percentage of respondents who listed tenderness and juiciness as reasons for buying beef with outside fat.

As the *occupational status of the husband* increased, the number of respondents listing color as an indication of tenderness decreased. Light or bright red lean was more often associated with tenderness of beef by the service, clerical, and skilled groups. With the exception of the professional group, the number of respondents associating fine grain or texture with tenderness increased as the occupational status increased. Marbling, as indicating tenderness in beef, was listed more often by the clerical and professional groups.

As the *level-of-living* score increased, the percentage of respondents suggesting marbling as an indication of tender beef increased. As the level-of-living score decreased, respondents listing light or bright red lean as an indication increased. Persons whose score was either high or low associated fine grain or texture with tenderness less often than did those in the middle groups.

As the *education of the homemaker* increased, the number reporting large amount of fat, fine grain or texture, and marbling, as tenderness indications, increased.

As the *husband's educational level* increased, a larger percentage of respondents suggested marbling as an indication of tender beef (Appendix Table 1).

## Sources of Help in Learning to Select Meat

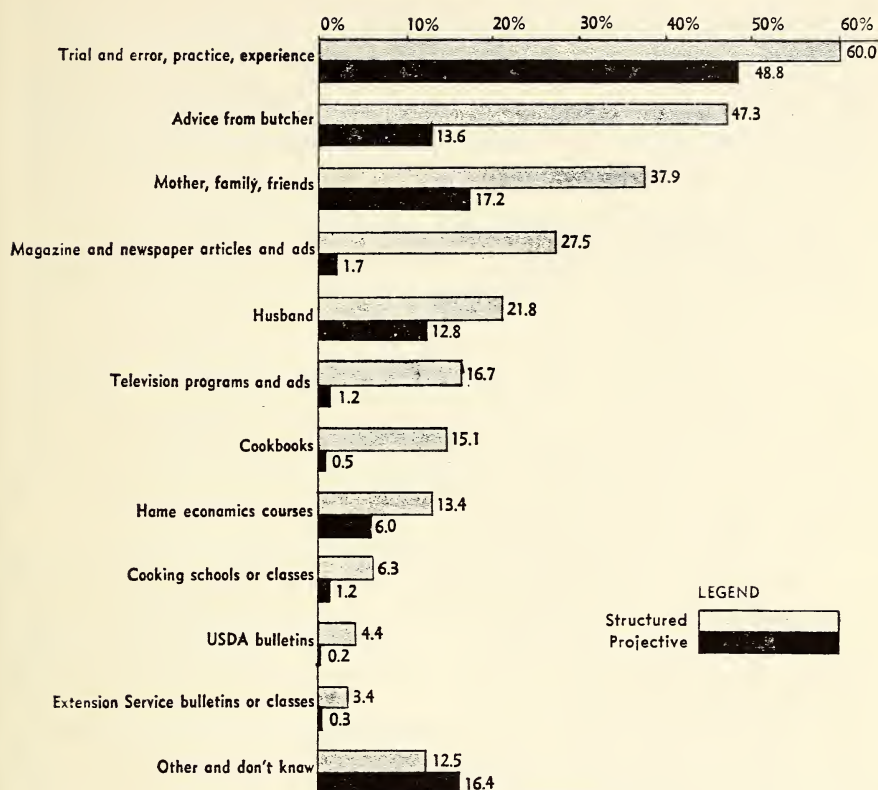
One factor to be considered in working with persons who buy and use meat is the source of help in learning to select meat, or how consumers learned what they know about meat selection. What or where are the channels for information on meat selection from the researcher to the consumer?

Two questions were designed to obtain this information, one with structured answers to check, and one, a projective-type question without any suggestions of answers. The projective question was placed near the beginning of the questionnaire, the structured one later. The structured-answer question drew more responses (1,576) than did the projective question (703). Very few other differences were apparent between the two methods of questioning. These are discussed with the respective questions.

In the aggregative analysis, trial and error or experience was listed most often in both structured and projective questions. In the projective, 49 percent of the respondents listed trial and error, 17 percent listed mother, family, friends, and about 14 percent listed both butcher and



FIG. 1.—Sources of Help in Learning to Select Meat, as Reported by Respondents.



husband. Home economics classes came in fifth position with 6 percent. Magazines and newspapers, cooking schools, television, Extension Service, and USDA publications each were listed as helpful by less than 2 percent of the respondents.

In response to the structured questions where answers were given to check, trial and error was indicated by 60 percent of the respondents; butcher rated second with 47 percent; mother, family, friends, was third with 38 percent. Magazine and newspaper articles and advertisements were indicated as a source of help by 28 percent of respondents, and husband was mentioned next by 22 percent.

More persons in structured than in projective questions indicated television and cookbooks helped in learning to select meat. Home economics classes were listed by 13 percent of the respondents to structured questions — twice as often as in the projective question. Cooking schools, USDA publications, radio, leaflets from food companies, and Extension

Service were listed least often, as was true for the projective test (Figure 1).

## The Influence of Family Characteristics

When sources of help in selecting meat were analyzed according to demographic data a few differences were detected between responses by white and non-white families. From both the structured and projective questions, the butcher was listed as being helpful more often by white respondents than by the non-white. The same was true when the husband was suggested as a source of help. More than twice as many non-white as white respondents reported using television as a source in the structured questions. Also, newspaper and magazine articles were listed as helpful sources more by non-white (31 percent) than white homemakers (26 percent).

*Income* of families seemed to indicate few differences in sources of help in selecting meat. Fewer persons in the upper income groups reported using television as a help in learning meat selection. Both the projective and structured responses indicated the husband in the middle income group helped slightly more with selecting meat. The upper income group reported greater use of cookbooks in meat selection than did the middle or lower groups.

The projective answers revealed a relation between the *occupation of the husband* and the sources of help used in selecting meat. The respondents of the service and professional occupation groups used trial and error or practice more often as an aid for learning to select meat than did the unemployed, skilled or clerical groups. The husbands in the skilled category helped more in learning to select meat, while information gained from work outside the home was of greater benefit to those in the unemployed and retired group. The structured answers showed that as the occupational status increased so did the number of respondents using a cookbook as a basis of selecting meat.

In both the structured and projective answers, the number of respondents who suggested the butcher as a source of help in selecting meat increased as the *level-of-living* score increased.

*Education of the homemaker* accounted for some differences in sources of help in learning to select meat. Homemakers with elementary or no education listed trial and error more often than did those with higher education. As the level of education increased, the number of respondents who listed home economics courses as being helpful in selecting meat increased. The same was true for "newspapers and magazines."

As the *educational level of the husband* increased, the percentage of homemakers reporting trial and error, butcher, and husband as helpful in learning to select meat increased in the structured answers. In the projective answers, home economics courses were listed as being helpful more often by the respondents whose husbands had college training than by those whose husbands had only high school or elementary training (Appendix Tables 2 and 3).

# Consumer Shopping Habits

## Who Usually Buys the Meat?

Meat purchasing was done by the wife or homemaker in slightly more than 75 percent of the households interviewed. The wife and husband together or the husband alone made the meat purchases in most of the other households—13 and 9 percent, respectively. Purchases were made by other persons in only about 3 percent of the households (Table 9).

TABLE 9.—Person Who Usually Purchases the Meat

| Person           | Number | Percent |
|------------------|--------|---------|
| Wife             | 443    | 75.3    |
| Wife and husband | 78     | 13.3    |
| Husband          | 51     | 8.7     |
| Other            | 15     | 2.6     |
| No answer        | 1      | 0.2     |
| Total            | 588    | 100.1   |

As one might expect, full-time homemakers made meat purchases alone more often, while husbands of full-time and part-time employed women more often helped with purchasing meat.

Certain characteristics of families seemed to have an effect on who usually purchased the meat. More homemakers purchased meat for families whose incomes were either under \$2,000 or over \$8,000 annually than those in the middle group. The percentage of wives who purchased the meat increased generally as the educational and occupational level of the husband increased. The education and occupation of the homemaker did not have the same effect. If the family owned their home, and especially if they owned a home freezer, the husband and wife together and the husband alone purchased meat more often than if they were not owners.

The wife, in families composed of three to five members, purchased meat slightly more often than did those in families having either more or fewer members. The percentage of wives who did the meat purchasing increased with the age of the homemaker. Husbands of homemakers under 30 years of age took a more active part in the purchase of meat than did those of older homemakers. Slightly more white than non-white husbands helped their wives in purchasing meat (Appendix Table 4).

## Do Husbands Help Decide on Meat?

Results of this study indicate that the husband plays an important role in deciding the kind and cut of meat that the homemaker serves her family. About 32 percent of the husbands helped decide what meats were served. But in contrast 37 percent of the husbands did not participate in such decisions (Table 10).

TABLE 10.—Percentage of Husbands Who Help Decide on Meat

| Item                                 | Number | Percent |
|--------------------------------------|--------|---------|
| Husbands usually help decide on meat | 188    | 32.0    |
| Husbands do not help decide          | 218    | 37.1    |
| Husbands sometimes help decide       | 53     | 9.0     |
| No husband                           | 118    | 20.1    |
| No answer                            | 11     | 1.9     |
| Total                                | 588    | 100.1   |

Younger husbands apparently took a more active part in deciding what meat would be served. Generally speaking, the number of husbands helping to decide decreased as the age of the homemaker increased.

## Do Husbands Help Shop?

Slightly more than 50 percent of the husbands of all respondents helped in shopping for groceries. But almost 28 percent of the homemakers reported no assistance from their husbands. Most of the other homemakers had no husbands. Forty-two percent of the respondents reported that their husbands sometimes shopped alone (Table 11).

TABLE 11.—Frequency of Husbands Who Shop for Food

| Response   | Husband shops with homemaker |           | Husband sometimes shops alone |           |
|------------|------------------------------|-----------|-------------------------------|-----------|
|            | (Number)                     | (Percent) | (Number)                      | (Percent) |
| Yes        | 295                          | 50.2      | 249                           | 42.3      |
| No         | 162                          | 27.6      | 187                           | 31.8      |
| No husband | 120                          | 20.4      | 120                           | 20.4      |
| No answer  | 11                           | 1.9       | 32                            | 5.4       |
| Total      | 588                          | 100.1     | 588                           | 99.9      |

## When Are Meat Purchasing Decisions Made?

Whether the consumer decides at the store what meat she will purchase or before getting to the store may be of particular interest to persons concerned with the marketing of beef. Ten percent more families

TABLE 12.—Time of Deciding What Meat to Purchase

| Time of decision        | Number | Percent |
|-------------------------|--------|---------|
| Before getting to store | 316    | 53.8    |
| At the store            | 257    | 43.7    |
| Other                   | 11     | 1.9     |
| No answer               | 4      | 0.7     |
| Total                   | 588    | 100.1   |



indicated that they decided what meat to purchase before getting to the store (54 percent as compared with 44 percent, Table 12).

In general, the frequency of deciding before getting to the store increased with the educational level of the homemaker and was slightly higher for respondents having an income of \$10,000 or more, for respondents 70 years of age or older, and for respondents who were non-white.

## Why Purchase at a Certain Store?

Reasons given most frequently for purchasing meat at a particular store were "quality of meat," "economy, low price, or on sale," and "convenience of location." Around 12 percent gave "do other shopping there" or "freshly cut meat" each as a reason. Other reasons, as shown in Table 13, were of minor relative importance.

TABLE 13.—Reasons for Purchasing Meat at a Certain Store

| Reason                                                      | Number | Percent* |
|-------------------------------------------------------------|--------|----------|
| Quality of meat                                             | 288    | 49.0     |
| Economy, low price, or on sale                              | 179    | 30.4     |
| Convenience of location                                     | 158    | 26.9     |
| Do other shopping there                                     | 73     | 12.4     |
| Fresh meat or freshly cut meat                              | 67     | 11.4     |
| Owners or clerks are good friends;<br>or used to work there | 46     | 7.8      |
| Good or wide selection                                      | 45     | 7.7      |
| Butcher cuts meat to order or special orders                | 25     | 4.3      |
| Delivery, credit, or telephone orders accepted              | 25     | 4.3      |
| Clean or good store                                         | 24     | 4.1      |
| Cash checks, give green stamps, or special service          | 17     | 2.9      |
| Special packaging of meat                                   | 16     | 2.7      |
| Habit                                                       | 15     | 2.6      |
| Store sells heavy beef                                      | 5      | 0.9      |
| Am looking for better place to shop                         | 4      | 0.7      |
| Wholesale prices                                            | 4      | 0.7      |
| Familiar with store or location of items                    | 3      | 0.5      |
| Other reasons                                               | 18     | 3.1      |

\*Percents total more than 100 because of multiple responses.

The Chi-square test was applied to answers obtained, by grouping responses according to certain personal data factors to determine whether the observed differences among groups were significant.

Income accounted for highly significant differences in reasons for purchasing meat at a certain store. The percentage of families who listed quality as a reason for buying meat at a certain store decreased as annual family income decreased. Families whose income ranged from \$4,000 to \$8,000 were more concerned with economy than were those with lower income and especially more than those with higher income.

Both education of husband and education of homemaker accounted for highly significant differences. In general, respondents with higher

education listed quality of meat more frequently as a reason for making purchases at a specific store.

As the occupational level of husbands increased, the percentage of respondents listing quality increased; conversely, the percentage listing economy decreased. Full-time homemakers were more concerned with economy and less concerned with convenient location than homemakers who worked.

Age of the male and/or female heads of household accounted for some differences in reasons for purchasing at a certain store. The middle age groups were more concerned with quality, while the older respondents were less concerned with economy than were those who were younger. "Do other shopping there" was the reason given third most frequently by homemakers under 30 years of age. The size of the family had some effect on the answers of some respondents. Families with three to five members and the one-member households listed quality more than did other size families. Economy was more important to families having six or more members.

Race made a highly significant difference in reasons for purchasing at a certain store. White respondents listed quality more often, while non-white respondents listed economy more often.

## How Often Do Consumers Buy Meat?

The frequency of purchasing meat varies with individual families and may be affected by various factors. Meat purchases were made about once a week by slightly more than half of the families in this sample. About one-fifth made meat purchases every two or three days, and about one-seventh did so only once in two weeks (Table 14).

TABLE 14.—Frequency of Purchasing Meat

| Frequency of purchasing    | Number | Percent |
|----------------------------|--------|---------|
| Nearly every day           | 28     | 4.8     |
| Every two or three days    | 120    | 20.4    |
| About once a week          | 322    | 54.8    |
| About once in two weeks    | 80     | 13.6    |
| About once in three weeks  | 1      | 0.2     |
| About once a month or less | 20     | 3.4     |
| Other                      | 14     | 2.4     |
| No answer                  | 3      | 0.5     |
| Total                      | 588    | 100.1   |

Respondents in the highest income level (\$10,000 or more) purchased meat more frequently than did those in any other income group. Those having an income of less than \$2,000 made slightly more once-a-month purchases than other groups. As might be expected, respondents who did not own freezers made meat purchases slightly more often than those who did.

I WONDER WHAT  
MRS. WILLIAMS LOOKS  
FOR TO BE SURE OF  
GETTING TENDER  
BEEF . . .



APPENDIX TABLE 1.—The Influence of Demographic Factors on Guides for Predicting Tenderness in Beef as Reported by Respondents

| Indication                 | Race           |                    | Family Income |                 |               | Occupation of husband   |                 |                  |                       |                            |             |  |
|----------------------------|----------------|--------------------|---------------|-----------------|---------------|-------------------------|-----------------|------------------|-----------------------|----------------------------|-------------|--|
|                            | White<br>(427) | Non-White<br>(161) | Low<br>(278)  | Medium<br>(125) | High<br>(182) | Unem-<br>ployed<br>(52) | Service<br>(72) | Skilled<br>(151) | Cler-<br>ical<br>(39) | Profes-<br>sional<br>(153) |             |  |
|                            |                |                    |               |                 |               |                         |                 |                  |                       |                            | (Percent) * |  |
| Light or bright red lean   | 27             | 24                 | 28            | 27              | 23            | 19                      | 36              | 27               | 36                    | 17                         |             |  |
| Fine grain or texture      | 24             | 23                 | 22            | 27              | 22            | 19                      | 21              | 24               | 23                    | 20                         |             |  |
| Marbling                   | 20             | 6                  | 8             | 13              | 15            | 10                      | 8               | 8                | 23                    | 18                         |             |  |
| Choice cut of meat         | 13             | 20                 | 17            | 18              | 11            | 15                      | 15              | 19               | 8                     | 9                          |             |  |
| Color                      | 13             | 12                 | 14            | 14              | 9             | 19                      | 11              | 15               | 8                     | 7                          |             |  |
| Small amount of fat        | 12             | 8                  | 9             | 12              | 23            | 19                      | 6               | 7                | 23                    | 7                          |             |  |
| Medium or dark color       | 9              | 11                 | 9             | 6               | 15            | 8                       | 8               | 8                | 5                     | 8                          |             |  |
| Top or high grade of meat  | 9              | 6                  | 6             | 10              | 8             | 8                       | 7               | 9                | 10                    | 7                          |             |  |
| Color of fat               | 8              | 3                  | 5             | 7               | 9             | 6                       | 4               | 8                | 8                     | 5                          |             |  |
| Large amount of fat        | 8              | 3                  | 4             | 6               | 10            | 4                       | 7               | 4                | 10                    | 5                          |             |  |
| Firm (not hard) appearance | 4              | 1                  | 3             | 4               | 4             | 2                       | 1               | 2                | 13                    | 3                          |             |  |
| Cut across grain           | 3              | 3                  | 2             | 5               | 3             | 0                       | 4               | 5                | 0                     | 1                          |             |  |
| Fresh, moist appearance    | 3              | 11                 | 8             | 6               | 8             | 8                       | 10              | 6                | 5                     | 1                          |             |  |
| Bone in meat               | 2              | 3                  | 3             | 2               | 2             | 0                       | 3               | 3                | 0                     | 0                          |             |  |
| Small size of cut          | 1              | 4                  | 2             | 1               | 2             | 2                       | 1               | 3                | 0                     | 0                          |             |  |
| High cost                  | 0              | 3                  | 1             | 1               | 0             | 0                       | 1               | 1                | 0                     | 1                          |             |  |
| Factors not pertinent      | 5              | 4                  | 4             | 6               | 4             | 2                       | 4               | 5                | 0                     | 4                          |             |  |
| Miscellaneous              | 3              | 2                  | 3             | 0               | 3             | 6                       | 1               | 1                | 0                     | 3                          |             |  |
| Don't know                 | 11             | 11                 | 13            | 10              | 10            | 10                      | 13              | 13               | 5                     | 5                          |             |  |

| Indication                 | Level-of-living score |              |  |              |    | Education of homemaker |               |                          | Education of husband    |                  |                          |                         |                  |
|----------------------------|-----------------------|--------------|--|--------------|----|------------------------|---------------|--------------------------|-------------------------|------------------|--------------------------|-------------------------|------------------|
|                            | 0-2<br>(89)           | 3-5<br>(248) |  | 6-8<br>(148) |    | 9-11<br>(66)           | 12-18<br>(37) | Elemen-<br>tary<br>(155) | High<br>school<br>(288) | College<br>(139) | Elemen-<br>tary<br>(151) | High<br>school<br>(185) | College<br>(142) |
|                            |                       |              |  | (Percent) *  |    |                        |               |                          |                         |                  |                          |                         |                  |
| Light or bright red lean   | 36                    | 26           |  | 26           | 26 |                        | 3             | 24                       | 30                      | 22               | 29                       | 32                      | 14               |
| Fine grain or texture      | 15                    | 25           |  | 26           | 27 |                        | 19            | 20                       | 23                      | 28               | 23                       | 26                      | 28               |
| Marbling                   | 15                    | 12           |  | 17           | 32 |                        | 38            | 8                        | 14                      | 28               | 8                        | 11                      | 40               |
| Choice cut of meat         | 17                    | 19           |  | 13           | 8  |                        | 8             | 17                       | 16                      | 11               | 18                       | 14                      | 19               |
| Color                      | 7                     | 16           |  | 10           | 9  |                        | 19            | 16                       | 13                      | 9                | 15                       | 16                      | 7                |
| Small amount of fat        | 5                     | 10           |  | 15           | 17 |                        | 5             | 8                        | 10                      | 14               | 8                        | 12                      | 12               |
| Medium or dark color       | 9                     | 7            |  | 10           | 12 |                        | 16            | 9                        | 8                       | 14               | 9                        | 9                       | 11               |
| Top or high grade of meat  | 5                     | 7            |  | 12           | 6  |                        | 11            | 5                        | 9                       | 8                | 7                        | 7                       | 7                |
| Color of fat               | 2                     | 6            |  | 7            | 12 |                        | 5             | 8                        | 5                       | 7                | 5                        | 5                       | 18               |
| Large amount of fat        | 6                     | 2            |  | 10           | 11 |                        | 16            | 5                        | 6                       | 9                | 2                        | 5                       | 3                |
| Firm (not hard) appearance | 0                     | 3            |  | 5            | 6  |                        | 0             | 3                        | 4                       | 4                | 4                        | 3                       | 2                |
| Cut across grain           | 1                     | 3            |  | 4            | 5  |                        | 0             | 1                        | 4                       | 3                | 9                        | 5                       | 1                |
| Fresh, moist appearance    | 9                     | 7            |  | 2            | 3  |                        | 3             | 6                        | 6                       | 3                | 1                        | 2                       | 9                |
| Bone in meat               | 2                     | 3            |  | 1            | 2  |                        | 3             | 2                        | 2                       | 2                | 1                        | 2                       | 0                |
| Small size of cut          | 5                     | 2            |  | 1            | 0  |                        | 0             | 5                        | 1                       | 1                | 3                        | 1                       | 0                |
| High cost                  | 0                     | 1            |  | 1            | 0  |                        | 0             | 1                        | 1                       | 0                | 1                        | 1                       | 1                |
| Factors not pertinent      | 7                     | 4            |  | 4            | 3  |                        | 11            | 6                        | 4                       | 4                | 6                        | 2                       | 6                |
| Miscellaneous              | 0                     | 3            |  | 3            | 2  |                        | 0             | 2                        | 3                       | 3                | 3                        | 1                       | 3                |
| Don't know                 | 15                    | 11           |  | 10           | 11 |                        | 11            | 14                       | 12                      | 7                | 11                       | 13                      | 9                |

\* Percents total more than 100 because of multiple responses.



APPENDIX TABLE 2.—The Influence of Demographic Factors on Sources of Help in Learning to Select Meat as Indicated by Respondents From Structured Questions

| Source                                      | Race                  |                    | Family Income |                 |               | Occupation of husband    |                         |                  |                          | Profes-<br>sional<br>(153) |                  |
|---------------------------------------------|-----------------------|--------------------|---------------|-----------------|---------------|--------------------------|-------------------------|------------------|--------------------------|----------------------------|------------------|
|                                             | White<br>(427)        | Non-White<br>(161) | Low<br>(278)  | Medium<br>(125) | High<br>(182) | Unem-<br>ployed<br>(52)  | Service<br>(72)         | Skilled<br>(151) | Cler-<br>ical<br>(39)    |                            |                  |
|                                             |                       |                    |               |                 |               |                          |                         |                  |                          |                            |                  |
|                                             |                       |                    |               |                 |               | (Percent)*               |                         |                  |                          |                            |                  |
| Trial and error, or practice                | 59                    | 63                 | 62            | 58              | 60            | 56                       | 67                      | 58               | 44                       | 63                         |                  |
| Advice from butcher                         | 51                    | 37                 | 41            | 53              | 52            | 37                       | 49                      | 48               | 51                       | 58                         |                  |
| Mother, mother-in-law, friends, and family  | 39                    | 40                 | 39            | 41              | 39            | 27                       | 44                      | 44               | 36                       | 46                         |                  |
| Newspaper and magazine articles             |                       |                    |               |                 |               |                          |                         |                  |                          |                            |                  |
| and grocery store ads                       | 26                    | 31                 | 24            | 33              | 29            | 15                       | 22                      | 33               | 23                       | 32                         |                  |
| Husband                                     | 23                    | 17                 | 17            | 25              | 27            | 15                       | 22                      | 29               | 15                       | 30                         |                  |
| Cookbooks                                   | 15                    | 14                 | 12            | 18              | 18            | 8                        | 15                      | 17               | 21                       | 21                         |                  |
| Home economics courses                      | 14                    | 14                 | 11            | 14              | 18            | 6                        | 14                      | 17               | 21                       | 17                         |                  |
| Television programs and commercials on food | 13                    | 27                 | 20            | 18              | 12            | 19                       | 17                      | 23               | 13                       | 13                         |                  |
| Cooking schools or classes                  | 6                     | 8                  | 5             | 6               | 9             | 6                        | 6                       | 7                | 8                        | 7                          |                  |
| Cooking publications                        | 5                     | 2                  | 3             | 5               | 6             | 4                        | 8                       | 5                | 0                        | 5                          |                  |
| Leaflets or booklets from food companies    | 3                     | 4                  | 3             | 5               | 4             | 0                        | 4                       | 4                | 5                        | 5                          |                  |
| USDA publications                           | 3                     | 4                  | 3             | 4               | 4             | 4                        | 3                       | 3                | 8                        | 3                          |                  |
| Extension Service bulletins or classes      | 3                     | 8                  | 6             | 6               | 1             | 4                        | 7                       | 5                | 8                        | 3                          |                  |
| Radio programs                              | 4                     | 6                  | 6             | 3               | 3             | 13                       | 1                       | 3                | 0                        | 1                          |                  |
| Other and don't know                        |                       |                    |               |                 |               |                          |                         |                  |                          |                            |                  |
|                                             | Education of husband  |                    |               |                 |               |                          |                         |                  |                          |                            |                  |
|                                             | Level-of-living score |                    |               |                 |               | Education of homemaker   |                         |                  |                          |                            |                  |
|                                             |                       |                    |               |                 |               | Elemen-<br>tary<br>(155) | High<br>school<br>(288) | College<br>(139) | Elemen-<br>tary<br>(151) | High<br>school<br>(185)    | College<br>(142) |
| Source                                      |                       |                    |               |                 |               | (Percent)*               |                         |                  |                          |                            |                  |
| Trial and error, or practice                | 64                    | 59                 | 55            | 67              | 60            | 62                       | 58                      | 60               | 60                       | 59                         | 73               |
| Advice from butcher                         | 40                    | 41                 | 55            | 55              | 62            | 37                       | 49                      | 50               | 48                       | 51                         | 54               |
| Mother, mother-in-law, friends, and family  | 39                    | 41                 | 37            | 38              | 51            | 31                       | 43                      | 53               | 34                       | 44                         | 42               |
| Newspaper and magazine articles             |                       |                    |               |                 |               |                          |                         |                  |                          |                            |                  |
| and grocery store ads                       | 22                    | 23                 | 37            | 38              | 14            | 25                       | 31                      | 47               | 25                       | 29                         | 30               |
| Husband                                     | 15                    | 21                 | 28            | 17              | 24            | 13                       | 26                      | 23               | 20                       | 27                         | 28               |
| Cookbooks                                   | 9                     | 13                 | 19            | 18              | 24            | 8                        | 17                      | 18               | 10                       | 19                         | 20               |
| Home economics courses                      | 5                     | 14                 | 20            | 12              | 11            | 3                        | 16                      | 24               | 10                       | 19                         | 18               |
| Television programs and commercials on food | 17                    | 21                 | 14            | 9               | 11            | 24                       | 27                      | 7                | 3                        | 18                         | 8                |
| Cooking schools or classes                  | 7                     | 4                  | 10            | 6               | 5             | 3                        | 7                       | 10               | 6                        | 5                          | 8                |
| USDA publications                           | 0                     | 4                  | 7             | 0               | 0             | 0                        | 5                       | 10               | 4                        | 6                          | 4                |
| Leaflets or bulletins from food companies   | 1                     | 3                  | 7             | 0               | 5             | 1                        | 5                       | 4                | 2                        | 5                          | 4                |
| Extension Service bulletins or classes      | 1                     | 2                  | 5             | 8               | 0             | 1                        | 5                       | 9                | 3                        | 4                          | 4                |
| Radio programs                              | 8                     | 4                  | 4             | 2               | 0             | 6                        | 5                       | 2                | 7                        | 5                          | 2                |
| Other and don't know                        | 7                     | 4                  | 5             | 5               | 3             | 7                        | 3                       | 4                | 5                        | 3                          | 2                |

\*Percents total more than 100 due to multiple responses.

APPENDIX TABLE 3.—The Influence of Demographic Factors on Sources Helpful in Selecting Meat as Indicated by Respondents From Projective Questions

| Source                                                | Race        |                 | Family Income |              |            | Occupation of husband |              |               |                 | Professional (153) |  |
|-------------------------------------------------------|-------------|-----------------|---------------|--------------|------------|-----------------------|--------------|---------------|-----------------|--------------------|--|
|                                                       | White (427) | Non-White (161) | Low (278)     | Medium (125) | High (182) | Unem- ployed (52)     | Service (72) | Skilled (151) | Cler- ical (39) |                    |  |
|                                                       |             |                 |               |              |            |                       |              |               |                 |                    |  |
|                                                       | (Percent) * |                 |               |              |            |                       |              |               |                 |                    |  |
| Trial and error, or practice                          | 50          | 46              | 50            | 46           | 50         | 52                    | 40           | 47            | 39              | 52                 |  |
| Advice from butcher                                   | 17          | 6               | 21            | 16           | 15         | 6                     | 11           | 11            | 36              | 16                 |  |
| Mother, mother-in-law, friends, and family            | 15          | 22              | 14            | 13           | 13         | 12                    | 25           | 23            | 10              | 12                 |  |
| Husband                                               | 14          | 10              | 10            | 16           | 14         | 12                    | 11           | 19            | 10              | 14                 |  |
| Home economics courses                                | 7           | 4               | 3             | 8            | 9          | 2                     | 6            | 3             | 10              | 10                 |  |
| Family and own preference                             | 4           | 1               | 3             | 5            | 4          | 6                     | 0            | 6             | 0               | 5                  |  |
| Appearance                                            | 3           | 4               | 4             | 1            | 3          | 4                     | 6            | 1             | 8               | 1                  |  |
| Study of meat                                         | 3           | 1               | 0             | 2            | 6          | 0                     | 0            | 3             | 5               | 4                  |  |
| Work outside home                                     | 3           | 9               | 6             | 3            | 3          | 10                    | 0            | 2             | 5               | 3                  |  |
| Magazine and newspaper articles and grocery store ads | 2           | 2               | 1             | 4            | 1          | 0                     | 1            | 2             | 0               | 3                  |  |
| Cooking schools and classes                           | 1           | 1               | 1             | 0            | 3          | 2                     | 1            | 1             | 0               | 1                  |  |
| Television programs and commercials on food           | 1           | 1               | 1             | 2            | 1          | 0                     | 0            | 2             | 5               | 2                  |  |
| Cookbooks                                             | 1           | 0               | 0             | 1            | 1          | 0                     | 0            | 0             | 0               | 1                  |  |
| Extension Service bulletins or classes                | 1           | 0               | 0             | 2            | 0          | 0                     | 0            | 1             | 0               | 1                  |  |
| USDA publications                                     | 0           | 0               | 0             | 1            | 0          | 0                     | 0            | 0             | 0               | 1                  |  |
| Other or don't know                                   | 3           | 7               | 7             | 2            | 1          | 10                    | 13           | 1             | 0               | 1                  |  |

| Source                                                | Level-of-living score |           |           |           |            | Education of homemaker |                   |               |                    | Education of husband |               |  |  |
|-------------------------------------------------------|-----------------------|-----------|-----------|-----------|------------|------------------------|-------------------|---------------|--------------------|----------------------|---------------|--|--|
|                                                       | 0-2 (89)              | 3-5 (248) | 6-8 (148) | 9-11 (66) | 12-18 (37) | Elemen- tary (155)     | High school (288) | College (139) | Elemen- tary (151) | High school (185)    | College (142) |  |  |
|                                                       |                       |           |           |           |            |                        |                   |               |                    |                      |               |  |  |
|                                                       | (Percent) *           |           |           |           |            |                        |                   |               |                    |                      |               |  |  |
| Trial and error, or practice                          | 57                    | 70        | 44        | 60        | 46         | 57                     | 46                | 45            | 54                 | 43                   | 44            |  |  |
| Advice from butcher                                   | 7                     | 11        | 18        | 18        | 27         | 10                     | 14                | 17            | 12                 | 13                   | 19            |  |  |
| Mother, mother-in-law, friends, and family            | 16                    | 23        | 12        | 8         | 14         | 14                     | 19                | 16            | 16                 | 20                   | 16            |  |  |
| Husband                                               | 8                     | 13        | 18        | 9         | 14         | 10                     | 14                | 13            | 13                 | 17                   | 11            |  |  |
| Home economics courses                                | 0                     | 6         | 9         | 8         | 11         | 1                      | 6                 | 13            | 3                  | 4                    | 6             |  |  |
| Family and own preference                             | 2                     | 4         | 3         | 5         | 5          | 1                      | 5                 | 4             | 3                  | 3                    | 4             |  |  |
| Appearance                                            | 2                     | 4         | 3         | 6         | 0          | 3                      | 4                 | 1             | 3                  | 3                    | 1             |  |  |
| Study of meat                                         | 0                     | 0         | 7         | 2         | 3          | 0                      | 2                 | 6             | 1                  | 5                    | 3             |  |  |
| Work outside home                                     | 9                     | 4         | 5         | 3         | 0          | 8                      | 2                 | 5             | 5                  | 3                    | 2             |  |  |
| Newspaper and magazine articles and grocery store ads | 1                     | 1         | 3         | 3         | 0          | 0                      | 2                 | 3             | 3                  | 1                    | 2             |  |  |
| Cooking schools and classes                           | 0                     | 2         | 2         | 0         | 0          | 1                      | 1                 | 2             | 2                  | 1                    | 1             |  |  |
| Television programs and commercials on food           | 1                     | 1         | 1         | 2         | 0          | 0                      | 2                 | 0             | 1                  | 1                    | 1             |  |  |
| Cookbooks                                             | 0                     | 0         | 1         | 0         | 0          | 0                      | 1                 | 1             | 0                  | 0                    | 2             |  |  |
| Extension Service bulletins or classes                | 0                     | 0         | 1         | 0         | 0          | 0                      | 1                 | 0             | 0                  | 1                    | 0             |  |  |
| USDA publications                                     | 0                     | 0         | 0         | 0         | 0          | 0                      | 0                 | 1             | 0                  | 1                    | 0             |  |  |
| Other and don't know                                  | 8                     | 5         | 2         | 0         | 0          | 5                      | 2                 | 1             | 5                  | 4                    | 2             |  |  |

\* Percents total more than 100 due to multiple responses.

**APPENDIX TABLE 4.—The Influence of Demographic Factors on the Person Who Usually Selects Meat**

| Demographic factor                    | Wife | Husband and wife | Husband | Other | No answer |
|---------------------------------------|------|------------------|---------|-------|-----------|
| (Percent)                             |      |                  |         |       |           |
| <u>Race</u>                           |      |                  |         |       |           |
| White (427)                           | 74   | 14               | 9       | 3     | 0         |
| Colored (161)                         | 78   | 11               | 8       | 3     | 0         |
| <u>Family Income</u>                  |      |                  |         |       |           |
| Low (278)                             | 76   | 12               | 9       | 3     | 0         |
| Medium (178)                          | 84   | 20               | 11      | 2     | 1         |
| High (99)                             | 81   | 9                | 7       | 3     | 0         |
| <u>Occupation of husband</u>          |      |                  |         |       |           |
| Unemployed (52)                       | 60   | 15               | 14      | 11    | 0         |
| Service (72)                          | 67   | 19               | 11      | 3     | 0         |
| Skilled (151)                         | 66   | 18               | 15      | 1     | 1         |
| Clerical (39)                         | 72   | 21               | 8       | 0     | 0         |
| Professional (153)                    | 79   | 14               | 7       | 0     | 0         |
| <u>Level-of-living score</u>          |      |                  |         |       |           |
| 0- 2 (89)                             | 85   | 10               | 2       | 2     | 0         |
| 3- 5 (248)                            | 71   | 9                | 17      | 4     | 0         |
| 6- 8 (148)                            | 74   | 8                | 16      | 2     | 0         |
| 9-11 (66)                             | 77   | 8                | 14      | 2     | 0         |
| 12-18 (27)                            | 84   | 8                | 8       | 0     | 0         |
| <u>Educational level of husband</u>   |      |                  |         |       |           |
| Elementary (151)                      | 68   | 17               | 11      | 3     | 0         |
| High school (185)                     | 68   | 18               | 11      | 2     | 1         |
| College (142)                         | 77   | 13               | 9       | 1     | 0         |
| <u>Educational level of homemaker</u> |      |                  |         |       |           |
| Elementary (155)                      | 79   | 10               | 9       | 3     | 0         |
| High school (287)                     | 74   | 16               | 8       | 2     | 0         |
| College (139)                         | 77   | 14               | 7       | 3     | 0         |









# PRICES AND PRICE INDEXES FOR LOUISIANA FARM PRODUCTS

## 1950 - 1962

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# INDEX

|                                                | Table No. | Page No. |
|------------------------------------------------|-----------|----------|
| Alfalfa hay                                    | 20        | 7        |
| Beef cattle                                    | 38        | 10       |
| Cabbage                                        | 32        | 9        |
| Chickens, all                                  | 47        | 11       |
| Chickens, farm                                 | 49        | 11       |
| Commercial broilers                            | 48        | 11       |
| Corn                                           | 17        | 6        |
| Cotton indexes                                 | 6         | 4        |
| Cotton prices                                  | 15        | 6        |
| Cottonseed                                     | 24        | 7        |
| Cowpeas                                        | 28        | 8        |
| Cows                                           | 41        | 10       |
| Crops, all                                     | 2         | 4        |
| Cucumbers                                      | 33        | 9        |
| Dairy products                                 | 13        | 6        |
| Eggs                                           | 51        | 11       |
| Farm products, all                             | 1         | 4        |
| Feed grains and hay                            | 5         | 4        |
| Food grains                                    | 4         | 4        |
| Fruits and nuts                                | 9         | 5        |
| Hay, all                                       | 19        | 7        |
| Hogs                                           | 42        | 10       |
| Lambs                                          | 44        | 10       |
| Lespedeza hay                                  | 21        | 7        |
| Livestock and livestock products, all          | 3         | 4        |
| Meat animals                                   | 12        | 5        |
| Milk cows                                      | 46        | 11       |
| Milk, wholesale                                | 45        | 10       |
| Oats                                           | 18        | 6        |
| Oil bearing crops                              | 7         | 5        |
| Oranges                                        | 28        | 8        |
| Peaches                                        | 29        | 8        |
| Pecans                                         | 28        | 8        |
| Peppers, green                                 | 35        | 9        |
| Potatoes                                       | 10        | 5        |
| Potatoes, Irish                                | 26        | 8        |
| Potatoes, sweet                                | 27        | 8        |
| Poultry and eggs                               | 14        | 6        |
| Prices paid by U. S. farmers                   | 53, 55    | 12, 14   |
| Purchasing power indexes for Louisiana farmers | 54        | 13       |
| Rice                                           | 16        | 6        |
| Shallots                                       | 34        | 9        |
| Sheep                                          | 43        | 10       |
| Sirup                                          | 28        | 8        |
| Snap beans                                     | 31        | 9        |
| Sorghum grain                                  | 23        | 7        |
| Soybeans                                       | 25        | 8        |
| Steers and heifers                             | 40        | 10       |
| Strawberries                                   | 30        | 8        |
| Sugar cane                                     | 28        | 8        |
| Sugar crops                                    | 8         | 5        |
| Tobacco                                        | 28        | 8        |
| Tomatoes                                       | 36        | 9        |
| Tung nuts                                      | 28        | 8        |
| Turkeys                                        | 50        | 11       |
| Veal calves                                    | 39        | 10       |
| Vegetables                                     | 11        | 5        |
| Watermelons                                    | 37        | 9        |
| Wheat                                          | 22        | 7        |
| Wool                                           | 52        | 11       |



# Prices and Price Indexes for Louisiana Farm Products, 1950-1962

by Lonnie L. Fielder, Jr. and Clarence O. Parker

This bulletin presents the monthly and annual prices and price indexes for Louisiana farm products for two five-year averages, 1950-54 and 1955-59, and the years 1960-1962. Prices and price indexes for individual years for the period 1910-1959 are presented in *Prices and Price Indexes for Louisiana Farm Products, 1910-1960*.<sup>1</sup>

The indexes of prices received by Louisiana farmers are presented in Tables 1 through 14. The prices received by Louisiana farmers are presented in Tables 15 through 52. The indexes of prices paid by farmers in the United States and the indexes of purchasing power for Louisiana farmers are presented in Tables 53 through 55.

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<sup>1</sup>Fielder, Lonnie L., Jr., and Parker, Clarence O., *Prices and Price Indexes for Louisiana Farm Products, 1910-1960*, D.A.E. Circular No. 310, April, 1962.

Table 1. All farm products: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 296  | 301  | 301  | 302  | 296 | 293  | 292  | 284  | 287   | 290  | 293  | 297  | 294  |
| 1955-59 | 263  | 267  | 269  | 269  | 269 | 268  | 268  | 266  | 268   | 264  | 262  | 262  | 266  |
| 1960    | 268  | 270  | 269  | 271  | 267 | 265  | 270  | 259  | 262   | 266  | 267  | 268  | 267  |
| 1961    | 268  | 271  | 273  | 277  | 274 | 274  | 274  | 272  | 276   | 280  | 279  | 282  | 275  |
| 1962    | 285  | 285  | 289  | 288  | 290 | 288  | 286  | 277  | 279   | 281  | 281  | 282  | 284  |

Table 2. All crops: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 291  | 297  | 299  | 301  | 294 | 293  | 289  | 279  | 282   | 288  | 292  | 296  | 292  |
| 1955-59 | 262  | 266  | 270  | 270  | 269 | 269  | 267  | 263  | 265   | 261  | 258  | 259  | 265  |
| 1960    | 259  | 260  | 258  | 261  | 257 | 258  | 266  | 256  | 259   | 264  | 263  | 260  | 260  |
| 1961    | 260  | 260  | 266  | 272  | 269 | 272  | 271  | 269  | 271   | 278  | 278  | 278  | 270  |
| 1962    | 275  | 277  | 284  | 285  | 287 | 288  | 282  | 267  | 264   | 268  | 270  | 271  | 276  |

Table 3. All livestock and livestock products: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14=100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 317  | 317  | 313  | 312  | 312 | 304  | 306  | 309  | 308   | 304  | 301  | 304  | 309  |
| 1955-59 | 265  | 268  | 267  | 267  | 269 | 265  | 269  | 269  | 271   | 270  | 269  | 268  | 268  |
| 1960    | 285  | 291  | 291  | 291  | 288 | 279  | 279  | 265  | 267   | 271  | 274  | 283  | 280  |
| 1961    | 286  | 294  | 288  | 286  | 283 | 276  | 280  | 278  | 285   | 283  | 282  | 287  | 284  |
| 1962    | 304  | 302  | 299  | 294  | 295 | 287  | 294  | 297  | 308   | 305  | 302  | 303  | 299  |

Table 4. Food grains (Rice): Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 302  | 305  | 304  | 300  | 298 | 287  | 278  | 254  | 247   | 277  | 286  | 294  | 286  |
| 1955-59 | 263  | 268  | 269  | 272  | 266 | 266  | 259  | 252  | 263   | 269  | 264  | 265  | 264  |
| 1960    | 265  | 273  | 265  | 262  | 265 | 259  | 259  | 232  | 235   | 248  | 273  | 262  | 258  |
| 1961    | 270  | 276  | 281  | 287  | 270 | 281  | 281  | 259  | 273   | 298  | 304  | 304  | 282  |
| 1962    | 309  | 315  | 320  | 320  | 309 | 298  | 287  | 257  | 257   | 273  | 281  | 284  | 292  |

Table 5. Feed grains and hay: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 210  | 212  | 211  | 210  | 211 | 203  | 202  | 201  | 199   | 200  | 204  | 207  | 206  |
| 1955-59 | 169  | 171  | 173  | 171  | 171 | 166  | 167  | 164  | 160   | 157  | 157  | 160  | 165  |
| 1960    | 162  | 164  | 171  | 169  | 165 | 163  | 164  | 164  | 157   | 160  | 164  | 162  | 164  |
| 1961    | 166  | 165  | 168  | 163  | 162 | 162  | 162  | 161  | 163   | 157  | 154  | 159  | 162  |
| 1962    | 161  | 161  | 160  | 164  | 164 | 166  | 159  | 164  | 160   | 161  | 163  | 166  | 162  |

Table 6. Cotton: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 292  | 297  | 298  | 302  | 298 | 302  | 301  | 301  | 309   | 302  | 303  | 301  | 301  |
| 1955-59 | 258  | 263  | 268  | 269  | 274 | 273  | 272  | 281  | 284   | 269  | 263  | 259  | 269  |
| 1960    | 266  | 266  | 264  | 268  | 255 | 261  | 261  | 269  | 273   | 272  | 259  | 248  | 264  |
| 1961    | 243  | 235  | 239  | 252  | 265 | 265  | 265  | 277  | 286   | 286  | 282  | 273  | 264  |
| 1962    | 261  | 261  | 254  | 261  | 282 | 294  | 298  | 286  | 281   | 273  | 270  | 268  | 274  |

Table 7. Oil bearing crops: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 309  | 320  | 318  | 322  | 317 | 315  | 304  | 290  | 313   | 310  | 326  | 327  | 314  |
| 1955-59 | 248  | 250  | 256  | 259  | 261 | 256  | 252  | 240  | 224   | 219  | 221  | 227  | 243  |
| 1960    | 196  | 202  | 207  | 208  | 207 | 207  | 208  | 196  | 193   | 206  | 213  | 213  | 205  |
| 1961    | 215  | 222  | 221  | 225  | 226 | 219  | 222  | 228  | 224   | 251  | 263  | 260  | 231  |
| 1962    | 260  | 253  | 249  | 249  | 249 | 249  | 247  | 240  | 237   | 240  | 243  | 244  | 247  |

Table 8. Sugar crops: Index numbers of prices received by Louisiana farmers, by crop years, 1950-1962 (1910-14 = 100)

| Year    | Index | Year | Index | Year | Index |
|---------|-------|------|-------|------|-------|
| 1950-54 | 197   | 1960 | 202   | 1962 | 214   |
| 1955-59 | 202   | 1961 | 208   |      |       |

Table 9. Fruits and nuts: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 182  | 231  | 257  | 228  | 186 | 187  | 187  | 186  | 186   | 192  | 192  | 192  | 200  |
| 1955-59 | 217  | 232  | 272  | 256  | 206 | 212  | 217  | 217  | 217   | 222  | 222  | 222  | 226  |
| 1960    | 229  | 229  | 229  | 282  | 262 | 262  | 262  | 262  | 262   | 254  | 254  | 254  | 253  |
| 1961    | 254  | 254  | 294  | 296  | 228 | 228  | 228  | 228  | 228   | 170  | 170  | 170  | 229  |
| 1962    | 170  | 170  | 265  | 232  | 176 | 177  | 177  | 177  | 177   | 251  | 251  | 251  | 206  |

Table 10. Potatoes: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 297  | 297  | 305  | 341  | 318 | 307  | 354  | 243  | 222   | 218  | 243  | 298  | 287  |
| 1955-59 | 247  | 243  | 236  | 235  | 234 | 235  | 255  | 174  | 148   | 127  | 135  | 198  | 206  |
| 1960    | 145  | 125  | 141  | 145  | 159 | 158  | 334  | 216  | 232   | 225  | 200  | 289  | 197  |
| 1961    | 276  | 311  | 318  | 310  | 307 | 307  | 300  | 256  | 176   | 170  | 166  | 243  | 262  |
| 1962    | 243  | 252  | 278  | 304  | 303 | 303  | 207  | 171  | 156   | 130  | 140  | 140  | 219  |

Table 11. Vegetables: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 291  | 276  | 263  | 282  | 268 | 276  | 257  | 252  | 279   | 303  | 303  | 300  | 279  |
| 1955-59 | 247  | 238  | 229  | 235  | 271 | 256  | 221  | 222  | 238   | 253  | 248  | 255  | 243  |
| 1960    | 273  | 266  | 260  | 208  | 254 | 284  | 267  | 264  | 293   | 286  | 240  | 235  | 261  |
| 1961    | 228  | 219  | 248  | 234  | 239 | 265  | 228  | 219  | 218   | 229  | 222  | 226  | 231  |
| 1962    | 221  | 240  | 349  | 293  | 274 | 228  | 213  | 205  | 217   | 235  | 234  | 277  | 240  |

Table 12. Meat animals: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 351  | 363  | 367  | 370  | 370 | 354  | 352  | 348  | 339   | 325  | 316  | 318  | 348  |
| 1955-59 | 287  | 298  | 305  | 313  | 318 | 312  | 314  | 312  | 310   | 302  | 296  | 296  | 305  |
| 1960    | 345  | 353  | 361  | 368  | 360 | 343  | 338  | 313  | 312   | 311  | 313  | 325  | 337  |
| 1961    | 329  | 347  | 351  | 354  | 350 | 340  | 349  | 343  | 351   | 344  | 339  | 348  | 345  |
| 1962    | 370  | 369  | 373  | 368  | 377 | 362  | 375  | 375  | 391   | 384  | 374  | 377  | 375  |

Table 13. Dairy products: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 263  | 257  | 248  | 240  | 239 | 238  | 242  | 247  | 259   | 265  | 270  | 268  | 253  |
| 1955-59 | 243  | 240  | 228  | 221  | 220 | 216  | 223  | 229  | 239   | 245  | 248  | 245  | 233  |
| 1960    | 234  | 242  | 233  | 217  | 223 | 221  | 226  | 225  | 231   | 236  | 240  | 244  | 231  |
| 1961    | 250  | 246  | 231  | 229  | 231 | 233  | 231  | 229  | 238   | 242  | 246  | 238  | 237  |
| 1962    | 252  | 246  | 238  | 236  | 231 | 231  | 227  | 231  | 234   | 242  | 246  | 242  | 238  |

Table 14. Poultry and eggs: Index numbers of prices received by Louisiana farmers, by months, 1950-1962 (1910-14 = 100)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 247  | 217  | 199  | 198  | 196 | 201  | 216  | 231  | 241   | 250  | 256  | 273  | 227  |
| 1955-59 | 207  | 201  | 196  | 185  | 183 | 184  | 187  | 188  | 189   | 191  | 195  | 198  | 192  |
| 1960    | 173  | 168  | 165  | 168  | 166 | 167  | 169  | 167  | 169   | 182  | 187  | 197  | 173  |
| 1961    | 189  | 189  | 174  | 161  | 152 | 143  | 141  | 147  | 147   | 153  | 155  | 168  | 160  |
| 1962    | 176  | 173  | 161  | 152  | 143 | 144  | 149  | 159  | 168   | 161  | 163  | 167  | 160  |

Table 15. Cotton lint: Average prices received by Louisiana farmers, 1950-1962 (Cents per pound, 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 34.8 | 35.3 | 35.5 | 35.9 | 35.5 | 36.0 | 35.8 | 35.8 | 36.8  | 36.0 | 36.1 | 35.8 | 36.2 |
| 1955-59 | 30.7 | 31.3 | 31.9 | 32.0 | 32.6 | 32.5 | 32.4 | 33.4 | 33.8  | 32.0 | 31.3 | 30.8 | 32.1 |
| 1960    | 31.7 | 31.6 | 31.4 | 31.9 | 30.3 | 31.0 |      | 32.0 | 32.5  | 32.4 | 30.8 | 29.5 | 30.9 |
| 1961    | 28.9 | 28.0 | 28.4 | 30.0 | 31.5 | 31.5 | 31.5 | 33.0 | 34.0  | 34.0 | 33.5 | 32.5 | 33.5 |
| 1962    | 31.1 | 31.0 | 30.2 | 31.0 | 33.5 | 35.0 | 35.5 | 34.0 | 33.4  | 32.5 | 32.1 | 31.9 | 32.7 |

Table 16. Rice: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 5.47 | 5.52 | 5.51 | 5.44 | 5.39 | 5.20 | 5.04 | 4.61 | 4.47  | 5.02 | 5.18 | 5.32 | 4.88 |
| 1955-59 | 4.76 | 4.86 | 4.88 | 4.92 | 4.81 | 4.82 | 4.69 | 4.57 | 4.76  | 4.88 | 4.79 | 4.80 | 4.86 |
| 1960    | 4.80 | 4.95 | 4.80 | 4.75 | 4.80 | 4.70 | 4.70 | 4.20 | 4.25  | 4.50 | 4.95 | 4.75 | 4.55 |
| 1961    | 4.90 | 5.00 | 5.10 | 5.20 | 4.90 | 5.10 | 5.10 | 4.70 | 4.95  | 5.40 | 5.50 | 5.50 | 5.28 |
| 1962    | 5.60 | 5.70 | 5.80 | 5.80 | 5.60 | 5.40 | 5.20 | 4.65 | 4.65  | 4.95 | 5.10 | 5.15 | 4.95 |

Table 17. Corn: Average prices received by Louisiana farmers, 1950-1962 (Dollars per bushel, 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 1.58 | 1.62 | 1.62 | 1.64 | 1.65 | 1.62 | 1.61 | 1.57 | 1.53  | 1.52 | 1.52 | 1.55 | 1.58 |
| 1955-59 | 1.23 | 1.26 | 1.29 | 1.29 | 1.31 | 1.30 | 1.31 | 1.27 | 1.20  | 1.15 | 1.15 | 1.16 | 1.20 |
| 1960    | 1.20 | 1.21 | 1.27 | 1.26 | 1.26 | 1.24 | 1.23 | 1.21 | 1.15  | 1.17 | 1.19 | 1.16 | 1.19 |
| 1961    | 1.19 | 1.21 | 1.24 | 1.23 | 1.22 | 1.24 | 1.21 | 1.21 | 1.21  | 1.14 | 1.13 | 1.17 | 1.18 |
| 1962    | 1.17 | 1.19 | 1.21 | 1.22 | 1.24 | 1.27 | 1.23 | 1.23 | 1.16  | 1.17 | 1.19 | 1.23 | 1.21 |

Table 18. Oats: Average prices received by Louisiana farmers, 1950-1962 (Cents per bushel, 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 107  | 108  | 107  | 102  | 101 | 90   | 93   | 95   | 101   | 103  | 108  | 108  | 97   |
| 1955-59 | 87   | 86   | 86   | 84   | 81  | 71   | 74   | 77   | 81    | 83   | 84   | 84   | 76   |
| 1960    | 82   | 84   | 83   | 81   | 81  | 78   | 79   | 81   | 82    | 84   | 83   | 79   | 80   |
| 1961    | 82   | 80   | 79   | 75   | 75  | 69   | 73   | 77   | 77    | 85   | 76   | 80   | 74   |
| 1962    | 81   | 82   | 84   | 82   | 82  | 79   | 76   | 78   | 79    | 84   | 84   | 83   | 80   |



Table 19. All hay: Average prices received by Louisiana farmers, 1950-1962 (Dollars per ton, 15th of each month and crop-season averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 28.02 | 26.00 | 26.72 | 25.90 | 25.30 | 24.10 | 23.74 | 24.72 | 24.74 | 25.50 | 27.08 | 27.52 | 26.48 |
| 1955-59 | 23.68 | 24.20 | 23.84 | 22.70 | 22.18 | 21.56 | 21.34 | 20.68 | 21.20 | 21.70 | 21.98 | 22.68 | 22.26 |
| 1960    | 22.50 | 23.00 | 24.30 | 23.50 | 21.50 | 21.50 | 22.60 | 23.10 | 22.10 | 22.30 | 23.80 | 24.70 | 23.40 |
| 1961    | 25.50 | 24.10 | 24.10 | 22.60 | 22.40 | 22.70 | 23.40 | 22.10 | 23.10 | 22.20 | 22.40 | 22.70 | 22.60 |
| 1962    | 23.50 | 22.40 | 20.60 | 22.50 | 21.60 | 21.90 | 20.30 | 22.40 | 23.40 | 22.90 | 23.30 | 23.30 | 23.00 |

Table 20. Alfalfa hay: Average prices received by Louisiana farmers, 1950-1962 (Dollars per ton, 15th of each month and crop-season averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 40.30 | 39.60 | 37.60 | 36.40 | 35.80 | 32.70 | 32.70 | 33.40 | 34.90 | 35.90 | 38.10 | 39.24 | 36.38 |
| 1955-59 | 33.80 | 34.60 | 34.20 | 32.20 | 31.70 | 29.90 | 29.30 | 28.50 | 28.70 | 29.90 | 30.90 | 32.80 | 31.37 |
| 1960    | 32.00 | 32.00 | 34.00 | 33.00 | 30.00 | 30.00 | 31.00 | 31.00 | 31.00 | 33.00 | 36.00 | 36.00 | 32.40 |
| 1961    | 38.00 | 39.00 | 38.00 | 36.00 | 36.00 | 36.00 | 36.00 | 35.00 | 35.00 | 34.00 | 35.00 | 35.00 | 36.10 |
| 1962    | 34.00 | 34.00 | 32.00 | 34.00 | 31.00 | 32.50 | 32.50 | 33.50 | 34.50 | 34.00 | 33.50 | 35.00 | 33.40 |

Table 21. Lespedeza hay: Average prices received by Louisiana farmers, 1950-1962 (Dollars per ton, 15th of each month and crop-season averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 29.82 | 28.92 | 28.68 | 28.14 | 27.34 | 26.30 | 25.90 | 26.80 | 25.90 | 27.50 | 29.70 | 29.90 | 27.91 |
| 1955-59 | 26.40 | 26.90 | 26.60 | 25.10 | 24.70 | 24.80 | 25.10 | 23.80 | 24.10 | 25.00 | 25.00 | 25.00 | 25.21 |
| 1960    | 26.00 | 26.00 | 28.00 | 27.00 | 24.00 | 25.00 | 27.00 | 27.00 | 25.00 | 26.00 | 28.00 | 28.00 | 26.40 |
| 1961    | 29.00 | 27.00 | 29.00 | 27.00 | 27.00 | 28.00 | 28.00 | 26.00 | 27.00 | 27.00 | 27.00 | 24.00 | 27.15 |
| 1962    | 26.00 | 26.00 | 25.00 | 27.00 | 25.00 | 26.50 | 26.50 | 27.00 | 28.00 | 27.50 | 27.00 | 27.00 | 26.55 |

Table 22. Wheat: Average prices received by Louisiana farmers, 1957-1962 (Dollars per bushel, 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1957-59 | 1.93 | 1.90 | 1.90 | 1.90 | 1.85 | 1.76 | 1.77 | 1.80 | 1.81  | 1.82 | 1.83 | 1.87 | 1.77 |
| 1960    | 1.90 | 1.85 | 1.90 | 1.90 | 1.85 | 1.70 | 1.70 | 1.75 | 1.78  | 1.78 | 1.78 | 1.78 | 1.71 |
| 1961    | 1.80 | 1.80 | 1.78 | 1.78 | 1.73 | 1.70 | 1.72 | 1.75 | 1.75  | 1.75 | 1.75 | 1.75 | 1.71 |
| 1962    | 1.75 | 1.78 | 1.80 | 1.82 | 1.85 | 1.95 | 1.95 | 2.00 | 2.00  | 1.95 | 2.00 | 2.05 | 1.95 |

Table 23. Sorghum grain: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 2.46 | 2.45 | 2.48 | 2.48 | 2.51 | 2.44 | 2.46 | 2.52 | 2.47  | 2.36 | 2.42 | 2.47 | 2.48 |
| 1955-59 | 2.01 | 2.01 | 2.05 | 2.10 | 2.13 | 2.14 | 2.16 | 2.05 | 1.93  | 1.85 | 1.85 | 1.89 | 1.90 |
| 1960    | 1.80 | 1.80 | 1.80 | 1.80 | 1.80 | 1.80 | 1.80 | 1.80 | 1.65  | 1.65 | 1.65 | 1.70 | 1.68 |
| 1961    | 1.70 | 1.70 | 1.75 | 1.75 | 1.80 | 1.80 | 1.80 | 1.70 | 1.70  | 1.70 | 1.70 | 1.70 | 1.73 |
| 1962    | 1.72 | 1.75 | 1.80 | 1.85 | 1.85 | 1.85 | 1.90 | 1.85 | 1.85  | 1.80 | 1.80 | 1.85 | 1.86 |

Table 24. Cottonseed: Average prices received by Louisiana farmers, 1960-1962 (Dollars per ton, 15th of each month and crop-season averages)

| Year | Jan.  | Feb.  | Mar.  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1960 | 28.00 | 40.00 | 41.00 | 38.00 | 37.00 | 40.00 | 42.00 | 42.00 | 39.70 |
| 1961 | 42.00 | 43.00 | 42.00 | 44.00 | 44.00 | 50.00 | 53.00 | 52.00 | 50.20 |
| 1962 | 52.00 | 50.00 | 48.00 | 46.00 | 46.00 | 46.00 | 46.00 | 46.00 | 46.00 |

Table 25. Soybeans: Average prices received by Louisiana farmers, 1950-1962  
(Dollars per bushel, 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 2.69 | 2.82 | 3.02 | 3.22 | 3.22 | 3.24 | 3.09 | 2.90 | 2.63  | 2.40 | 2.52 | 2.61 | 2.57 |
| 1955-59 | 2.24 | 2.30 | 2.39 | 2.50 | 2.55 | 2.44 | 2.28 | 2.21 | 2.03  | 2.01 | 1.99 | 2.01 | 2.04 |
| 1960    | 1.95 | 1.90 | 1.95 | 2.00 | 1.95 | 1.95 | 2.00 | 1.95 | 1.95  | 1.95 | 1.95 | 1.95 | 1.99 |
| 1961    | 2.05 | 2.15 | 2.25 | 2.40 | 2.45 | 2.20 | 2.30 | 2.25 | 2.10  | 2.15 | 2.20 | 2.20 | 2.18 |
| 1962    | 2.20 | 2.20 | 2.30 | 2.30 | 2.30 | 2.30 | 2.25 | 2.25 | 2.15  | 2.15 | 2.25 | 2.30 | 2.25 |

Table 26. Irish potatoes: Average prices received by Louisiana farmers, 1960-1962  
(Dollars per cwt., 15th of each month and crop-season averages)

| Year | Apr. | May  | June | July | Ave. |
|------|------|------|------|------|------|
| 1960 |      | 3.20 | 3.00 | 2.95 | 3.17 |
| 1961 | 3.25 | 2.75 | 2.65 | 2.65 | 2.75 |
| 1962 |      | 2.50 | 2.50 | 2.40 | 2.49 |

Table 27. Sweet potatoes: Average prices received by Louisiana farmers, 1950-1962  
(Dollars per cwt., 15th of each month and crop-season averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 4.51 | 4.50 | 4.65 | 5.17 | 4.92 | 4.72 | 5.59 | 3.66 | 3.24  | 3.11 | 3.56 | 4.51 | 3.74 |
| 1955-59 | 3.64 | 3.58 | 3.48 | 3.47 | 3.42 | 3.46 | 3.75 | 2.48 | 2.08  | 1.75 | 1.87 | 2.87 | 2.30 |
| 1960    | 2.00 | 1.70 | 1.95 | 2.00 | 2.25 |      | 5.00 | 3.15 | 3.40  | 3.30 | 2.90 | 4.30 | 3.30 |
| 1961    | 4.10 | 4.65 | 4.75 | 4.60 |      |      | 4.50 | 3.80 | 2.55  | 2.45 | 2.40 | 3.60 | 2.75 |
| 1962    | 3.60 | 3.75 | 4.15 | 4.55 |      |      | 3.05 | 2.50 | 2.25  | 1.85 | 2.00 | 2.00 | 2.10 |

Table 28. Crop season average prices received by Louisiana farmers: Sugar cane and sirup, oranges, pecans, tung nuts, cowpeas, and tobacco, 1950-1962

| Year    | Sugar cane<br>(\$/ton) | Sirup<br>(\$/gal) | Oranges<br>(\$/box) | Pecans |          |                               | Tung nuts<br>(\$/ton) | Cowpeas<br>(\$/bu.) | Tobacco<br>(¢/lb.) |
|---------|------------------------|-------------------|---------------------|--------|----------|-------------------------------|-----------------------|---------------------|--------------------|
|         |                        |                   |                     | Total  | Improved | Wild or seedlings<br>(\$/lb.) |                       |                     |                    |
| 1950-54 | 6.84                   | .88               | 3.15                | 21.5   | 26.0     | 19.9                          | 78.20                 | 4.47                | 60.6               |
| 1955-59 | 7.01                   | .85               | 3.39                | 25.9   | 29.1     | 25.5                          | 52.20                 | 4.21                | 69.5               |
| 1960    | 7.16                   | .83               | 3.75                | 30.2   | 33.0     | 29.0                          | 63.00                 | 3.70                | 73.0               |
| 1961    | 7.46                   | .84               | 2.75                | 16.9   | 20.5     | 16.5                          | 92.00                 | 4.30                | 70.5               |
| 1962    | 7.45                   | .85               | 7.00                | 35.0   | 40.0     | 30.0                          | 105.00                | 3.50                | 69.0               |

Table 29. Peaches: Average prices received by Louisiana farmers, 1960-1962 (Dollars per bushel, 15th of each month and crop-season averages)

| Year | June | July | Aug. | Ave. |
|------|------|------|------|------|
| 1960 | 2.55 | 2.80 | 2.55 | 2.70 |
| 1961 | 2.70 | 2.60 |      | 2.70 |
| 1962 | 3.50 | 3.50 |      | 3.50 |

Table 30. Strawberries: Average prices received by Louisiana farmers, 1960-1962 (cents per pound), monthly and crop-season averages for fresh market crop and crop-season average for total crop including processed berries

| Year | Mar. | Apr. | May  | Ave. <sup>1</sup> | Ave. <sup>2</sup> |
|------|------|------|------|-------------------|-------------------|
| 1960 |      | 32.3 | 27.4 | 30.1              | 29.5              |
| 1961 | 37.2 | 37.6 | 21.0 | 31.9              | 30.2              |
| 1962 | 44.0 | 36.0 | 22.4 | 30.8              | 28.5              |

<sup>1</sup>Fresh market.

<sup>2</sup>All.

Table 31. Snap beans: Average prices received by Louisiana farmers, 1960-1962 (Dollars per cwt., month and crop-season averages)

| Year | Mar.  | Apr.  | May  | June | July | Ave. <sup>1</sup> | Sept. | Oct. | Nov. | Dec. | Ave. <sup>2</sup> |
|------|-------|-------|------|------|------|-------------------|-------|------|------|------|-------------------|
| 1960 |       | 7.20  | 7.20 | 6.40 |      | 7.10              | 8.20  | 7.10 | 7.10 | 7.10 | 7.10              |
| 1961 | 11.00 | 11.00 | 9.20 | 8.50 | 8.30 | 9.00              | 8.20  | 7.00 | 6.40 |      | 6.90              |
| 1962 |       | 8.50  | 8.30 | 7.00 | 6.70 | 8.00              | 8.00  | 6.70 | 6.30 |      | 6.60              |

<sup>1</sup>Mid-spring.      <sup>2</sup>Early fall.

Table 32. Cabbage: Average prices received by Louisiana farmers, 1960-1962 (Dollars per cwt., 15th of each month and crop-season aves.)

| Year | Jan. | Feb. | Mar. | Apr. | May  | June | Nov. | Dec. | Ave. |
|------|------|------|------|------|------|------|------|------|------|
| 1960 | 3.30 | 3.00 | 2.90 | 2.00 | 2.90 | 4.00 | 2.00 | 2.00 | 2.80 |
| 1961 | 1.80 | 1.50 | 1.70 | 1.40 | 1.45 | 1.75 | 2.00 | 2.10 | 1.55 |
| 1962 | 2.00 | 2.35 | 6.80 | 4.30 | 2.50 |      |      | 3.75 | 3.40 |

Table 33. Cucumbers: Average prices received by Louisiana farmers, 1960-1962 (Dollars per cwt., 15th of each month and crop-season aves.)

| Year | May  | June | July | Ave. <sup>1</sup> | Aug. | Sept. | Oct. | Nov. | Ave. <sup>2</sup> |
|------|------|------|------|-------------------|------|-------|------|------|-------------------|
| 1960 | 4.10 | 3.55 | 3.50 | 3.75              | 6.60 | 3.30  | 3.50 | 5.40 | 3.65              |
| 1961 | 5.00 | 5.00 | 4.25 | 4.85              |      | 4.00  | 3.00 | 3.00 | 3.25              |
| 1962 | 5.40 | 3.50 | 4.40 | 3.90              | 4.00 | 4.80  | 4.45 | 3.65 | 4.45              |

<sup>1</sup>Late spring.      <sup>2</sup>Early fall.

Table 34. Shallots: Average prices received by Louisiana farmers, 1960-1962 (Dollars per cwt., month and crop-season averages)

| Year | Jan. | Feb. | Mar. | Apr. | May  | June | Sept. | Oct. | Nov. | Dec. | Ave. <sup>1</sup> | Ave. <sup>2</sup> |
|------|------|------|------|------|------|------|-------|------|------|------|-------------------|-------------------|
| 1960 | 5.00 | 4.90 | 4.50 | 4.20 | 4.25 |      | 7.50  | 7.40 | 6.40 | 5.80 | 5.60              | 4.30              |
| 1961 | 5.50 | 5.20 | 5.20 | 4.30 | 4.50 | 4.50 |       | 7.00 | 6.70 | 6.30 | 6.50              | 4.80              |
| 1962 | 6.00 | 7.20 | 8.80 | 7.00 | 4.50 |      |       | 7.50 | 8.00 | 9.80 | 6.80              | 6.50              |

<sup>1</sup>Winter.      <sup>2</sup>Spring.

Table 35. Green peppers: Average prices received by Louisiana farmers, 1960-1962 (dollars per cwt., 15th of each month and crop-season averages)

| Year | May   | June | July | Aug. | Ave. |
|------|-------|------|------|------|------|
| 1960 |       | 7.40 | 8.40 |      | 7.80 |
| 1961 | 11.00 | 9.00 | 8.00 | 8.00 | 8.80 |
| 1962 | 12.50 | 7.50 | 5.30 | 5.30 | 7.15 |

Table 36. Tomatoes: Average prices received by Louisiana farmers, 1960-1962 (Dollars per cwt., month and crop-season averages)

| Year | May   | June  | July | Ave.  |
|------|-------|-------|------|-------|
| 1960 | 15.00 | 13.20 | 9.50 | 12.60 |
| 1961 | 11.00 | 12.50 | 7.50 | 12.30 |
| 1962 | 13.00 | 9.50  | 6.70 | 9.50  |

Table 37. Watermelons: Average prices received by Louisiana farmers, 1960-62 (Dollars per cwt., month and crop-season averages)

| Year | June | July | Aug. | Sept. | Ave. |
|------|------|------|------|-------|------|
| 1960 | 2.10 | 1.50 | .75  |       | 1.25 |
| 1961 | 2.30 | 1.50 | 1.00 |       | 1.75 |
| 1962 |      | 1.10 | .80  | .80   | 1.00 |

Table 38. Beef cattle: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 17.50 | 18.34 | 18.68 | 18.86 | 18.62 | 17.42 | 16.94 | 16.52 | 16.20 | 15.36 | 14.92 | 15.14 | 16.92 |
| 1955-59 | 12.48 | 13.04 | 13.52 | 13.78 | 13.98 | 13.50 | 13.60 | 13.56 | 13.56 | 13.38 | 13.14 | 13.26 | 13.38 |
| 1960    | 16.40 | 16.80 | 17.20 | 17.30 | 16.50 | 16.10 | 15.50 | 14.60 | 14.80 | 14.50 | 14.40 | 14.90 | 15.70 |
| 1961    | 15.20 | 16.30 | 16.60 | 16.50 | 16.10 | 15.80 | 16.20 | 16.10 | 16.30 | 15.90 | 15.40 | 15.40 | 16.00 |
| 1962    | 16.90 | 17.30 | 17.40 | 17.00 | 17.50 | 16.60 | 17.10 | 16.80 | 17.60 | 17.20 | 16.90 | 17.10 | 17.10 |

Table 39. Veal calves: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 22.38 | 23.48 | 23.34 | 23.64 | 23.38 | 22.60 | 21.94 | 21.60 | 20.58 | 19.68 | 19.18 | 19.86 | 21.52 |
| 1955-59 | 17.94 | 18.60 | 19.12 | 19.64 | 19.96 | 19.66 | 19.76 | 19.50 | 19.30 | 18.72 | 18.36 | 18.44 | 19.08 |
| 1960    | 22.30 | 22.50 | 22.70 | 23.40 | 23.30 | 21.30 | 21.20 | 18.90 | 18.60 | 18.60 | 19.00 | 20.00 | 20.90 |
| 1961    | 20.50 | 21.50 | 21.50 | 22.00 | 22.00 | 21.20 | 21.60 | 20.90 | 21.60 | 21.10 | 21.10 | 22.50 | 21.40 |
| 1962    | 23.50 | 23.10 | 23.50 | 23.40 | 23.90 | 23.00 | 23.90 | 24.20 | 25.10 | 24.90 | 24.00 | 24.20 | 24.00 |

Table 40. Steers and heifers: Average prices received by Louisiana farmers, 1959-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1959 | 22.40 | 22.80 | 23.00 | 23.80 | 24.70 | 24.00 | 24.00 | 23.70 | 23.00 | 21.50 | 21.00 | 19.60 | 22.90 |
| 1960 | 20.20 | 20.80 | 21.20 | 21.90 | 20.90 | 20.10 | 19.10 | 17.80 | 17.60 | 17.60 | 17.50 | 18.60 | 19.40 |
| 1961 | 19.30 | 19.70 | 20.40 | 20.60 | 19.70 | 19.50 | 20.00 | 19.70 | 20.00 | 19.20 | 19.60 | 19.60 | 19.80 |
| 1962 | 20.60 | 21.40 | 21.40 | 21.20 | 22.00 | 21.20 | 21.80 | 21.10 | 22.30 | 22.00 | 22.20 | 22.70 | 21.70 |

Table 41. Cows: Average prices received by Louisiana farmers, 1959-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1959 | 16.70 | 16.60 | 17.50 | 17.30 | 17.30 | 16.80 | 16.40 | 15.50 | 15.50 | 15.00 | 14.80 | 14.50 | 16.20 |
| 1960 | 15.00 | 15.20 | 15.70 | 15.30 | 14.70 | 14.60 | 13.90 | 13.00 | 13.50 | 13.10 | 13.20 | 13.40 | 14.20 |
| 1961 | 13.60 | 14.90 | 15.10 | 14.60 | 14.60 | 14.40 | 14.50 | 14.20 | 14.50 | 14.30 | 13.60 | 13.60 | 14.30 |
| 1962 | 15.30 | 15.30 | 15.50 | 14.90 | 15.30 | 14.50 | 14.60 | 14.40 | 15.00 | 14.50 | 14.50 | 14.60 | 14.80 |

Table 42. Hogs: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 17.42 | 17.80 | 17.98 | 18.20 | 18.98 | 19.04 | 19.54 | 19.60 | 19.16 | 18.62 | 18.34 | 17.60 | 18.32 |
| 1955-59 | 15.12 | 15.32 | 15.00 | 15.62 | 15.72 | 16.18 | 16.18 | 16.20 | 15.94 | 15.38 | 14.82 | 14.32 | 15.36 |
| 1960    | 11.50 | 12.40 | 13.40 | 14.00 | 13.90 | 14.20 | 14.80 | 15.00 | 14.50 | 15.10 | 15.10 | 15.20 | 14.00 |
| 1961    | 14.40 | 14.80 | 15.20 | 15.30 | 15.10 | 14.40 | 15.30 | 15.60 | 15.90 | 15.80 | 15.60 | 15.30 | 15.20 |
| 1962    | 15.60 | 15.00 | 15.20 | 15.00 | 15.20 | 15.20 | 15.70 | 16.00 | 16.50 | 15.80 | 15.70 | 15.60 | 15.50 |

Table 43. Sheep: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|-------|-------|-------|-------|-------|------|------|------|-------|------|------|------|------|
| 1950-54 | 10.16 | 10.36 | 10.54 | 10.52 | 10.64 | 9.84 | 9.62 | 9.44 | 9.48  | 9.24 | 9.46 | 9.64 | 9.96 |
| 1955-59 | 6.98  | 6.92  | 7.04  | 7.26  | 7.06  | 6.88 | 6.72 | 6.78 | 6.58  | 6.68 | 6.82 | 6.80 | 6.88 |
| 1960    | 7.00  | 7.00  | 7.10  | 7.10  | 7.10  | 6.80 | 6.50 | 6.30 | 6.30  | 6.10 | 6.20 | 6.50 | 6.60 |
| 1961    | 7.00  | 7.00  | 7.00  | 6.70  | 6.00  | 5.50 | 5.50 | 5.30 | 5.30  | 5.30 | 5.30 | 5.40 | 5.80 |
| 1962    | 5.30  | 5.60  | 5.60  | 5.60  | 5.60  | 5.80 | 5.90 | 5.60 | 5.60  | 5.70 | 5.90 | 6.10 | 5.70 |

Table 44. Lambs: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year    | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  | Ave.  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1950-54 | 19.56 | 20.26 | 20.82 | 20.84 | 20.50 | 19.82 | 19.82 | 18.92 | 18.66 | 17.80 | 18.06 | 18.38 | 19.54 |
| 1955-59 | 16.80 | 17.24 | 17.58 | 18.02 | 18.04 | 17.74 | 17.42 | 17.50 | 17.28 | 17.30 | 17.34 | 16.80 | 17.46 |
| 1960    | 16.50 | 16.70 | 17.50 | 18.00 | 18.00 | 18.00 | 18.00 | 17.00 | 16.20 | 16.00 | 16.00 | 15.80 | 17.10 |
| 1961    | 16.20 | 16.20 | 16.20 | 15.90 | 15.90 | 16.20 | 15.50 | 15.50 | 15.50 | 15.30 | 15.00 | 14.70 | 15.70 |
| 1962    | 14.50 | 14.50 | 14.70 | 15.30 | 14.00 | 14.80 | 14.20 | 14.90 | 14.90 | 14.50 | 14.70 | 15.20 | 14.70 |

Table 45. Milk, wholesale: Average prices received by Louisiana farmers, 1950-1962 (Dollars per cwt., 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 6.35 | 6.14 | 5.89 | 5.65 | 5.64 | 5.63 | 5.70 | 5.93 | 6.23  | 6.45 | 6.60 | 6.53 | 6.06 |
| 1955-59 | 5.89 | 5.81 | 5.49 | 5.30 | 5.29 | 5.19 | 5.37 | 5.52 | 5.78  | 5.92 | 6.01 | 5.91 | 5.62 |
| 1960    | 5.65 | 5.85 | 5.60 | 5.20 | 5.35 | 5.30 | 5.45 | 5.40 | 5.55  | 5.70 | 5.80 | 5.90 | 5.56 |
| 1961    | 6.05 | 5.95 | 5.55 | 5.50 | 5.55 | 5.60 | 5.55 | 5.50 | 5.75  | 5.85 | 5.95 | 5.75 | 5.71 |
| 1962    | 6.10 | 5.95 | 5.75 | 5.70 | 5.55 | 5.55 | 5.45 | 5.55 | 5.65  | 5.85 | 5.95 | 5.85 | 5.74 |



Table 46. Milk cows: Average prices received by Louisiana farmers, 1959-1962  
(Dollars per head, 15th of each month and annual averages)

| Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1959 | 160  | 165  | 170  | 170  | 175 | 175  | 185  | 180  | 180   | 180  | 180  | 175  | 175  |
| 1960 | 175  | 175  | 185  | 180  | 180 | 180  | 185  | 180  | 180   | 170  | 180  | 190  | 180  |
| 1961 | 175  | 180  | 175  | 185  | 180 | 180  | 185  | 185  | 190   | 190  | 190  | 195  | 184  |
| 1962 | 190  | 185  | 185  | 180  | 180 | 180  | 175  | 185  | 190   | 185  | 180  | 190  | 184  |

Table 47. All chickens: Average prices received by Louisiana farmers, 1950-1962  
(Cents per pound, 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 27.7 | 27.4 | 27.9 | 27.8 | 27.5 | 27.3 | 28.4 | 29.0 | 28.6  | 27.4 | 27.5 | 26.5 | 27.8 |
| 1955-59 | 19.6 | 20.2 | 21.8 | 20.2 | 20.8 | 21.0 | 20.4 | 19.5 | 18.3  | 17.4 | 17.7 | 16.7 | 19.5 |
| 1960    | 16.4 | 16.9 | 16.8 | 17.0 | 16.9 | 16.9 | 16.9 | 16.1 | 15.1  | 15.2 | 15.2 | 15.2 | 16.2 |
| 1961    | 15.6 | 17.1 | 16.1 | 14.7 | 13.7 | 12.2 | 11.8 | 12.1 | 11.1  | 11.2 | 11.8 | 14.4 | 13.2 |
| 1962    | 15.4 | 16.3 | 15.8 | 14.5 | 13.6 | 13.5 | 13.9 | 15.0 | 15.6  | 14.1 | 14.1 | 14.1 | 14.7 |

Table 48. Commercial broilers: Average prices received by Louisiana farmers, 1950-1962 (Cents per pound, 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 27.5 | 27.7 | 28.5 | 28.2 | 27.6 | 27.8 | 29.2 | 29.6 | 29.2  | 27.3 | 26.9 | 26.4 | 28.1 |
| 1955-59 | 19.5 | 20.1 | 21.8 | 20.2 | 20.8 | 21.0 | 20.4 | 19.5 | 18.3  | 17.4 | 17.6 | 16.5 | 19.4 |
| 1960    | 16.5 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 16.0 | 15.0  | 15.0 | 15.0 | 15.0 | 16.2 |
| 1961    | 15.5 | 17.0 | 16.0 | 14.5 | 13.5 | 12.0 | 11.5 | 12.0 | 11.0  | 11.0 | 11.5 | 14.5 | 13.1 |
| 1962    | 15.5 | 16.5 | 16.0 | 14.5 | 13.5 | 13.5 | 14.0 | 15.0 | 15.5  | 14.0 | 14.0 | 14.0 | 14.7 |

Table 49. Farm chickens: Average prices received by Louisiana farmers, 1950-1962  
(Cents per pound, 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 28.9 | 28.1 | 28.2 | 28.2 | 28.3 | 27.4 | 27.2 | 28.2 | 28.0  | 28.0 | 28.6 | 27.6 | 28.0 |
| 1955-59 | 21.0 | 21.2 | 21.4 | 21.5 | 21.1 | 20.7 | 21.0 | 20.4 | 20.1  | 20.0 | 19.7 | 19.8 | 20.7 |
| 1960    | 15.5 | 16.0 | 15.5 | 15.5 | 16.0 | 16.0 | 16.0 | 17.0 | 16.5  | 17.0 | 16.5 | 16.5 | 16.2 |
| 1961    | 17.0 | 18.0 | 17.5 | 17.0 | 15.5 | 15.0 | 15.0 | 13.0 | 12.0  | 13.0 | 13.5 | 14.0 | 14.6 |
| 1962    | 14.0 | 13.5 | 13.5 | 14.0 | 15.0 | 14.0 | 13.0 | 15.0 | 16.0  | 15.0 | 15.0 | 15.0 | 14.4 |

Table 50. Turkeys: Average prices received by Louisiana farmers, 1950-1962  
(Cents per pound, 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 44.0 | 42.8 | 41.8 | 42.7 | 42.0 | 40.6 | 40.6 | 40.0 | 41.4  | 43.6 | 42.6 | 43.1 | 42.5 |
| 1955-59 | 33.6 | 33.4 | 33.8 | 33.6 | 33.4 | 32.8 | 33.2 | 32.8 | 32.4  | 32.0 | 31.4 | 32.4 | 32.0 |
| 1960    | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 26.0 | 26.0  | 28.0 | 28.0 | 30.0 | 27.6 |
| 1961    | 30.0 |      |      |      |      | 26.0 | 26.0 | 24.0 | 24.0  | 23.0 | 24.0 | 24.0 | 24.0 |
| 1962    | 26.0 | 24.0 | 26.0 | 26.0 | 23.0 | 24.0 | 24.0 | 24.0 | 24.0  | 24.0 | 25.0 | 25.0 | 24.6 |

Table 51. Eggs: Average prices received by Louisiana farmers, 1950-1962 (Cents per dozen, 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|------|------|------|------|-------|------|------|------|------|
| 1950-54 | 54.2 | 44.9 | 38.3 | 37.5 | 37.4 | 39.2 | 42.6 | 46.9 | 50.7  | 54.4 | 56.4 | 62.8 | 44.8 |
| 1955-59 | 51.1 | 47.2 | 42.0 | 40.3 | 38.4 | 38.4 | 40.6 | 43.1 | 45.7  | 48.2 | 49.9 | 52.8 | 44.2 |
| 1960    | 42.6 | 39.6 | 38.3 | 39.2 | 38.5 | 39.0 | 39.9 | 40.6 | 43.5  | 49.0 | 50.9 | 55.3 | 42.6 |
| 1961    | 51.1 | 48.4 | 43.5 | 40.9 | 39.0 | 38.0 | 38.0 | 40.0 | 42.0  | 44.0 | 43.7 | 44.5 | 42.6 |
| 1962    | 45.8 | 42.9 | 38.7 | 37.2 | 35.3 | 35.7 | 37.2 | 39.4 | 41.9  | 42.0 | 43.0 | 44.5 | 40.3 |

Table 52. Wool: Average prices per pound received by Louisiana farmers, 1950-1962  
(Cents per pound, 15th of each month and annual averages)

| Year    | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|---------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1950-54 | 55   | 55   | 57   | 58   | 59  | 60   | 66   | 58   | 57    | 58   | 57   | 56   | 65   |
| 1955-59 | 38   | 40   | 39   | 39   | 39  | 38   | 42   | 38   | 41    | 39   | 45   | 39   | 42   |
| 1960    | 42   | 39   | 35   | 40   | 40  | 42   | 46   | 40   | 39    | 39   | 39   | 40   | 40   |
| 1961    | 34   | 40   | 37   | 34   | 38  | 40   | 44   | 47   | 40    | 38   | 40   | 43   | 40   |
| 1962    | 35   | 40   | 39   | 43   | 38  | 38   | 40   | 41   | 40    | 40   | 41   | 41   | 40   |

Table 53. Index numbers of prices paid by farmers for commodities, interest, taxes, and wage rates, United States, by months, 1923-1962 (1910-14 = 100)

| Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1923 |      |      | 158  |      |     | 159  |      |      | 160   |      |      | 159  | 159  |
| 1924 |      |      | 160  |      |     | 159  |      |      | 160   |      |      | 161  | 160  |
| 1925 |      |      | 165  |      |     | 164  |      |      | 163   |      |      | 162  | 164  |
| 1926 |      |      | 161  |      |     | 162  |      |      | 160   |      |      | 159  | 160  |
| 1927 |      |      | 159  |      |     | 159  |      |      | 159   |      |      | 159  | 159  |
| 1928 |      |      | 162  |      |     | 164  |      |      | 162   |      |      | 161  | 162  |
| 1929 |      |      | 162  |      |     | 161  |      |      | 160   |      |      | 159  | 160  |
| 1930 |      |      | 157  |      |     | 154  |      |      | 150   |      |      | 144  | 151  |
| 1931 |      |      | 138  |      |     | 132  |      |      | 126   |      |      | 122  | 130  |
| 1932 |      |      | 117  |      |     | 112  |      |      | 110   |      |      | 107  | 112  |
| 1933 |      |      | 102  |      |     | 105  |      |      | 115   |      |      | 115  | 109  |
| 1934 |      |      | 118  |      |     | 118  |      |      | 122   |      |      | 123  | 120  |
| 1935 |      |      | 125  |      |     | 125  |      |      | 123   |      |      | 123  | 124  |
| 1936 |      |      | 122  |      |     | 122  |      |      | 126   |      |      | 127  | 124  |
| 1937 | 129  | 130  | 132  | 133  | 134 | 133  | 133  | 132  | 130   | 129  | 128  | 127  | 131  |
| 1938 | 127  | 127  | 126  | 125  | 125 | 125  | 124  | 123  | 122   | 122  | 122  | 123  | 124  |
| 1939 | 123  | 123  | 122  | 123  | 123 | 122  | 122  | 121  | 123   | 123  | 123  | 123  | 123  |
| 1940 | 124  | 124  | 125  | 125  | 125 | 123  | 123  | 123  | 123   | 123  | 124  | 124  | 124  |
| 1941 | 126  | 126  | 126  | 128  | 129 | 130  | 133  | 135  | 137   | 139  | 140  | 142  | 133  |
| 1942 | 144  | 146  | 148  | 150  | 151 | 152  | 153  | 154  | 154   | 157  | 158  | 159  | 152  |
| 1943 | 162  | 164  | 166  | 169  | 171 | 172  | 172  | 173  | 172   | 175  | 175  | 177  | 171  |
| 1944 | 178  | 180  | 180  | 182  | 182 | 182  | 183  | 183  | 183   | 184  | 184  | 185  | 182  |
| 1945 | 187  | 188  | 188  | 190  | 190 | 190  | 190  | 190  | 190   | 191  | 191  | 192  | 190  |
| 1946 | 194  | 195  | 196  | 198  | 200 | 203  | 211  | 214  | 213   | 220  | 225  | 224  | 208  |
| 1947 | 227  | 229  | 234  | 237  | 237 | 238  | 240  | 242  | 245   | 247  | 249  | 253  | 240  |
| 1948 | 262  | 257  | 258  | 261  | 262 | 263  | 263  | 261  | 260   | 258  | 258  | 257  | 260  |
| 1949 | 256  | 253  | 256  | 255  | 254 | 253  | 251  | 249  | 249   | 247  | 246  | 247  | 251  |
| 1950 | 249  | 249  | 250  | 251  | 254 | 255  | 257  | 258  | 261   | 262  | 264  | 266  | 256  |
| 1951 | 273  | 277  | 281  | 284  | 284 | 283  | 283  | 283  | 283   | 284  | 285  | 285  | 282  |
| 1952 | 288  | 289  | 289  | 290  | 290 | 288  | 287  | 288  | 286   | 283  | 282  | 281  | 287  |
| 1953 | 282  | 280  | 279  | 278  | 278 | 274  | 276  | 277  | 275   | 274  | 274  | 275  | 277  |
| 1954 | 278  | 278  | 279  | 279  | 280 | 278  | 276  | 277  | 277   | 276  | 276  | 275  | 277  |
| 1955 | 278  | 278  | 279  | 278  | 277 | 277  | 275  | 274  | 273   | 274  | 274  | 272  | 276  |
| 1956 | 274  | 274  | 275  | 277  | 278 | 278  | 279  | 280  | 280   | 280  | 281  | 281  | 278  |
| 1957 | 284  | 285  | 286  | 286  | 287 | 286  | 286  | 286  | 286   | 287  | 287  | 288  | 286  |
| 1958 | 290  | 291  | 293  | 294  | 295 | 294  | 293  | 293  | 294   | 294  | 294  | 295  | 293  |
| 1959 | 298  | 297  | 297  | 298  | 298 | 298  | 297  | 297  | 296   | 296  | 296  | 296  | 297  |
| 1960 | 299  | 299  | 300  | 302  | 301 | 299  | 298  | 298  | 298   | 296  | 297  | 298  | 299  |
| 1961 | 302  | 302  | 302  | 302  | 302 | 301  | 301  | 301  | 301   | 301  | 301  | 302  | 302  |
| 1962 | 304  | 305  | 305  | 307  | 307 | 305  | 305  | 305  | 307   | 307  | 307  | 309  | 306  |

Table 54. Index numbers of purchasing power<sup>1</sup> for Louisiana farmers, by months, 1923-1962 (1910-14 = 100)

| Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Ave. |
|------|------|------|------|------|-----|------|------|------|-------|------|------|------|------|
| 1923 |      |      | 116  |      |     | 108  |      |      | 111   |      |      | 130  | 116  |
| 1924 |      |      | 119  |      |     | 118  |      |      | 106   |      |      | 106  | 112  |
| 1925 |      |      | 107  |      |     | 104  |      |      | 102   |      |      | 92   | 101  |
| 1926 |      |      | 92   |      |     | 87   |      |      | 86    |      |      | 72   | 84   |
| 1927 |      |      | 78   |      |     | 79   |      |      | 99    |      |      | 91   | 87   |
| 1928 |      |      | 91   |      |     | 90   |      |      | 86    |      |      | 88   | 89   |
| 1929 |      |      | 92   |      |     | 86   |      |      | 88    |      |      | 86   | 88   |
| 1930 |      |      | 83   |      |     | 80   |      |      | 67    |      |      | 65   | 74   |
| 1931 |      |      | 70   |      |     | 63   |      |      | 54    |      |      | 56   | 61   |
| 1932 |      |      | 58   |      |     | 49   |      |      | 61    |      |      | 55   | 56   |
| 1933 |      |      | 59   |      |     | 70   |      |      | 69    |      |      | 71   | 67   |
| 1934 |      |      | 81   |      |     | 76   |      |      | 85    |      |      | 82   | 81   |
| 1935 |      |      | 84   |      |     | 82   |      |      | 76    |      |      | 85   | 82   |
| 1936 |      |      | 86   |      |     | 87   |      |      | 90    |      |      | 91   | 88   |
| 1937 | 90   | 93   | 92   | 94   | 87  | 84   | 84   | 80   | 75    | 73   | 73   | 71   | 83   |
| 1938 | 71   | 70   | 72   | 70   | 70  | 70   | 71   | 72   | 71    | 72   | 73   | 72   | 71   |
| 1939 | 72   | 71   | 75   | 72   | 72  | 72   | 72   | 71   | 78    | 76   | 76   | 77   | 74   |
| 1940 | 77   | 77   | 78   | 77   | 78  | 78   | 79   | 78   | 76    | 77   | 78   | 78   | 78   |
| 1941 | 80   | 82   | 85   | 89   | 89  | 90   | 94   | 93   | 98    | 101  | 104  | 107  | 93   |
| 1942 | 110  | 110  | 118  | 115  | 112 | 108  | 108  | 106  | 108   | 108  | 108  | 109  | 110  |
| 1943 | 111  | 111  | 113  | 120  | 115 | 114  | 116  | 111  | 113   | 113  | 111  | 108  | 113  |
| 1944 | 109  | 108  | 112  | 112  | 108 | 107  | 105  | 104  | 105   | 108  | 109  | 109  | 108  |
| 1945 | 109  | 107  | 109  | 108  | 109 | 109  | 109  | 108  | 108   | 112  | 113  | 114  | 110  |
| 1946 | 112  | 112  | 116  | 116  | 116 | 114  | 119  | 121  | 124   | 134  | 124  | 127  | 120  |
| 1947 | 125  | 126  | 126  | 124  | 122 | 121  | 125  | 124  | 116   | 116  | 118  | 122  | 122  |
| 1948 | 120  | 120  | 122  | 123  | 120 | 121  | 119  | 112  | 110   | 107  | 108  | 110  | 116  |
| 1949 | 109  | 107  | 105  | 108  | 106 | 105  | 104  | 104  | 103   | 102  | 101  | 100  | 105  |
| 1950 | 100  | 102  | 103  | 103  | 102 | 104  | 107  | 113  | 119   | 120  | 122  | 124  | 110  |
| 1951 | 122  | 126  | 124  | 124  | 120 | 117  | 113  | 105  | 104   | 103  | 108  | 109  | 115  |
| 1952 | 110  | 110  | 109  | 112  | 108 | 113  | 112  | 109  | 109   | 110  | 108  | 109  | 110  |
| 1953 | 109  | 110  | 111  | 110  | 109 | 107  | 104  | 97   | 95    | 99   | 99   | 100  | 104  |
| 1954 | 99   | 99   | 98   | 96   | 94  | 91   | 93   | 90   | 93    | 95   | 93   | 94   | 95   |
| 1955 | 94   | 95   | 96   | 97   | 96  | 94   | 93   | 93   | 94    | 92   | 91   | 90   | 94   |
| 1956 | 90   | 91   | 91   | 90   | 90  | 90   | 89   | 89   | 90    | 92   | 90   | 91   | 90   |
| 1957 | 92   | 94   | 93   | 92   | 93  | 93   | 96   | 94   | 95    | 92   | 92   | 91   | 93   |
| 1958 | 93   | 94   | 96   | 96   | 96  | 95   | 95   | 96   | 96    | 93   | 94   | 95   | 95   |
| 1959 | 95   | 95   | 96   | 95   | 95  | 95   | 94   | 92   | 93    | 92   | 91   | 91   | 94   |
| 1960 | 90   | 90   | 90   | 90   | 89  | 89   | 91   | 87   | 87    | 90   | 90   | 90   | 89   |
| 1961 | 89   | 90   | 90   | 92   | 91  | 91   | 91   | 90   | 92    | 93   | 93   | 93   | 91   |
| 1962 | 94   | 93   | 94   | 94   | 94  | 94   | 93   | 91   | 91    | 92   | 92   | 91   | 93   |

<sup>1</sup>Index number of purchasing power equals index of prices received for all farm products for Louisiana divided by index of prices paid for U.S.

Table 55. Index numbers of prices paid by farmers, interest, taxes, and wage rates, United States, 1910-1962 (1910-14 = 100)

| Year | Prices paid for items used in: |             |                        | Interest payable per acre | Taxes payable per acre | Wage rates for hired labor <sup>1</sup> | Prices paid, interest, taxes, and wage rates |
|------|--------------------------------|-------------|------------------------|---------------------------|------------------------|-----------------------------------------|----------------------------------------------|
|      | Living                         | Pro-duction | Living and pro-duction |                           |                        |                                         |                                              |
| 1910 | 99                             | 97          | 98                     | 83                        | 90                     | 96                                      | 97                                           |
| 1911 | 99                             | 98          | 99                     | 91                        | 91                     | 98                                      | 98                                           |
| 1912 | 100                            | 102         | 101                    | 101                       | 99                     | 101                                     | 101                                          |
| 1913 | 100                            | 101         | 100                    | 109                       | 103                    | 104                                     | 101                                          |
| 1914 | 102                            | 102         | 102                    | 116                       | 117                    | 101                                     | 103                                          |
| 1915 | 104                            | 104         | 104                    | 122                       | 118                    | 101                                     | 105                                          |
| 1916 | 115                            | 115         | 115                    | 132                       | 128                    | 112                                     | 116                                          |
| 1917 | 143                            | 156         | 150                    | 145                       | 136                    | 141                                     | 148                                          |
| 1918 | 170                            | 180         | 175                    | 159                       | 151                    | 177                                     | 173                                          |
| 1919 | 202                            | 195         | 199                    | 180                       | 160                    | 206                                     | 197                                          |
| 1920 | 228                            | 195         | 212                    | 216                       | 200                    | 241                                     | 214                                          |
| 1921 | 164                            | 128         | 146                    | 248                       | 244                    | 156                                     | 155                                          |
| 1922 | 153                            | 127         | 140                    | 260                       | 259                    | 154                                     | 151                                          |
| 1923 | 156                            | 138         | 148                    | 261                       | 261                    | 172                                     | 159                                          |
| 1924 | 156                            | 140         | 148                    | 250                       | 266                    | 182                                     | 160                                          |
| 1925 | 161                            | 145         | 153                    | 236                       | 265                    | 181                                     | 164                                          |
| 1926 | 158                            | 141         | 150                    | 228                       | 270                    | 183                                     | 160                                          |
| 1927 | 155                            | 141         | 148                    | 223                       | 271                    | 184                                     | 159                                          |
| 1928 | 156                            | 148         | 152                    | 219                       | 277                    | 184                                     | 162                                          |
| 1929 | 154                            | 146         | 150                    | 213                       | 279                    | 186                                     | 160                                          |
| 1930 | 144                            | 135         | 140                    | 206                       | 281                    | 177                                     | 151                                          |
| 1931 | 124                            | 113         | 119                    | 197                       | 277                    | 139                                     | 130                                          |
| 1932 | 106                            | 99          | 102                    | 185                       | 254                    | 104                                     | 112                                          |
| 1933 | 108                            | 99          | 104                    | 164                       | 220                    | 88                                      | 109                                          |
| 1934 | 122                            | 114         | 118                    | 147                       | 188                    | 99                                      | 120                                          |
| 1935 | 124                            | 122         | 123                    | 135                       | 178                    | 107                                     | 124                                          |
| 1936 | 124                            | 122         | 123                    | 125                       | 180                    | 114                                     | 124                                          |
| 1937 | 128                            | 132         | 130                    | 117                       | 181                    | 129                                     | 131                                          |
| 1938 | 122                            | 122         | 122                    | 110                       | 187                    | 130                                     | 124                                          |
| 1939 | 120                            | 121         | 121                    | 106                       | 185                    | 127                                     | 123                                          |
| 1940 | 121                            | 123         | 122                    | 102                       | 189                    | 129                                     | 124                                          |
| 1941 | 130                            | 130         | 130                    | 98                        | 187                    | 151                                     | 133                                          |
| 1942 | 149                            | 148         | 149                    | 94                        | 189                    | 197                                     | 152                                          |
| 1943 | 166                            | 164         | 165                    | 84                        | 185                    | 262                                     | 171                                          |
| 1944 | 175                            | 173         | 174                    | 79                        | 185                    | 318                                     | 182                                          |
| 1945 | 182                            | 176         | 179                    | 75                        | 192                    | 359                                     | 190                                          |
| 1946 | 202                            | 191         | 197                    | 74                        | 213                    | 387                                     | 208                                          |
| 1947 | 237                            | 224         | 230                    | 76                        | 237                    | 419                                     | 240                                          |
| 1948 | 251                            | 250         | 250                    | 78                        | 276                    | 442                                     | 260                                          |
| 1949 | 243                            | 238         | 240                    | 82                        | 298                    | 430                                     | 251                                          |
| 1950 | 246                            | 246         | 246                    | 89                        | 320                    | 425                                     | 256                                          |
| 1951 | 268                            | 273         | 271                    | 98                        | 335                    | 470                                     | 282                                          |
| 1952 | 271                            | 274         | 273                    | 108                       | 350                    | 503                                     | 287                                          |
| 1953 | 269                            | 256         | 261                    | 117                       | 365                    | 513                                     | 277                                          |
| 1954 | 270                            | 255         | 262                    | 126                       | 381                    | 510                                     | 277                                          |
| 1955 | 270                            | 251         | 259                    | 136                       | 394                    | 516                                     | 276                                          |
| 1956 | 274                            | 250         | 260                    | 150                       | 421                    | 536                                     | 278                                          |
| 1957 | 282                            | 257         | 267                    | 163                       | 440                    | 558                                     | 286                                          |
| 1958 | 287                            | 264         | 273                    | 176                       | 470                    | 574                                     | 293                                          |
| 1959 | 288                            | 266         | 275                    | 194                       | 496                    | 612                                     | 297                                          |
| 1960 | 290                            | 265         | 275                    | 213                       | 534                    | 631                                     | 299                                          |
| 1961 | 291                            | 266         | 276                    | 232                       | 588                    | 641                                     | 302                                          |
| 1962 | 294                            | 269         | 279                    | 241                       | 625                    | 660                                     | 306                                          |

<sup>1</sup>Adjusted for seasonal variation.





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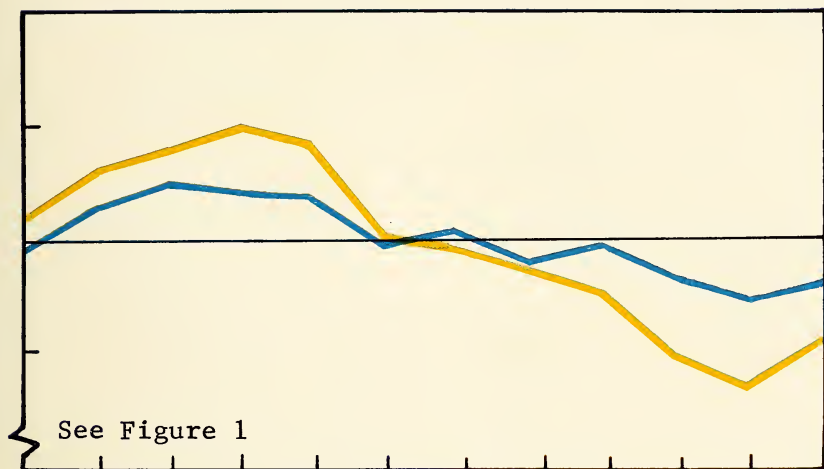
1922

1944

[illegible]

1940

# SEASONAL PATTERNS OF PRICES AND PRODUCTION FOR LOUISIANA FARM PRODUCTS



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# Seasonal Patterns of Prices and Production For Louisiana Farm Products

LONNIE L. FIELDER, JR.

Variations in the prices of crops and livestock and in the production of livestock and livestock products generally are composed of four principal elements. These are trend, cyclical, seasonal, and irregular changes. These four types of changes are also referred to as the major "time series components"; that is, they are four types of changes that normally occur in economic data such as prices and production.

Trend indicates the overall direction and rate of movement, either up or down, over a given period of time. The cyclical component reflects the alterations in the general economy such as prosperity and depression. The seasonal component reflects movements among months or seasons. The irregular component refers to the part unexplained by trend, cyclical, or seasonal movements. It may be referred to as "random" or accidental changes.

The major purpose of this study is to analyze and present the seasonal patterns for prices and production of livestock, and for prices of crops, in Louisiana. The analysis consists of (1) presenting the average seasonal patterns for the three time periods 1951-1962, 1951-1953, and 1960-1963; (2) indicating the significant shifts in seasonal movements during the period 1951-1953 to 1960-1962; and (3) presenting the 1963 projected seasonal patterns.

A knowledge of seasonal movements of prices can be a valuable guide in deciding when to sell farm commodities and will be of interest to farmers, Agricultural Extension Service, Farmers Home Administration, Soil Conservation Service, vocational agriculture teachers, farm loan agencies, and others who are interested in planning a farm business for greater profit.

Indexes of seasonal variations computed in this study include:

- (1) Prices received by farmers for beef cattle, calves, hogs, sheep, lambs, wool, eggs, all chickens, farm chickens, broilers, turkeys, wholesale milk, cotton, rice, sweet potatoes, soybeans, corn, wheat, oats, all hay, alfalfa hay, lespedeza hay, and grain sorghum.
- (2) The following production quantities: number of cattle slaughtered, number of calves slaughtered, number of hogs slaughtered, egg production, eggs per 100 layers, and number of layers.
- (3) The following livestock-feed price ratios: cattle-corn ratio, calf-corn ratio, and hog-corn ratio.

Data on individual farm commodities in this report are averages for Louisiana as reported by the Statistical Reporting Service, United States Department of Agriculture.

## Procedure for Computing Seasonal Index

The seasonal index numbers in this study are defined as the per cent of the annual average price or quantity. That is, the indexes show the value

for each month as a percentage of the average for the year. An index of 110 for beef cattle prices in May, for example, means that the seasonal price of beef cattle in that month is 10 per cent greater than the average for the entire 12 months.

The seasonal indexes presented here were derived by the Shiskin-Eisenpress adaptation of the ratio-to-moving average.<sup>1</sup> This method consists of the following steps: (1) computation of a centered 12-month moving average; (2) computation of ratios, dividing the original data by the centered moving average; (3) replacing extreme ratios by more representative ones; (4) computation of a 3-term average of the ratios; (5) computation of a preliminary seasonally adjusted series by dividing the original data by the ratios; (6) computation of a weighted 15-month moving average of the preliminary seasonally adjusted series to obtain the trend-cycle component; (7) dividing the preliminary seasonally adjusted series by the trend-cycle component to get the irregular component; and (8) dividing the original data by the trend-cycle and irregular components to get the seasonal component.

"Average amplitudes" of the irregular movements were also computed. Average amplitudes are average month-to-month percentage changes, disregarding direction of change. The magnitude of the irregular amplitudes enables one to judge the importance and "predictability" of the seasonal index.

## Seasonal Variations in Prices and Production of Individual Farm Products

The method described above was used to analyze the seasonal price and production patterns for the major farm commodities in Louisiana. The seasonal indexes are shown in Tables 1 through 32 and in Figures 1 through 32. Each table includes the following: (1) 1951-1962 average seasonal indexes; (2) 1951-1953 average seasonal indexes; (3) 1960-1962 average seasonal indexes; (4) 1963 projected seasonal indexes; (5) average irregular amplitude for the 1951-1962 period; and (6) correlation coefficient between the 1951-1953 average seasonal indexes and the 1960-1962 average seasonal indexes.

### Prices

**Beef cattle.** The seasonal pattern of price variation for beef cattle in Louisiana typically shows an April peak and a November low, as indicated by the 1951-1962 average seasonal indexes (Table 1 and Figure 1). The principal change in seasonality of beef cattle prices during the 1951-1962 period was a reduction in the degree of variation. Although beef cattle prices usually are relatively low from August to December and relatively high in other months, this pattern has become less distinct in recent years. There was no significant difference in the seasonal pattern during this period, as indicated by a correlation coefficient of 0.963 between the average seasonal indexes for

<sup>1</sup>For a more detailed description of this method, see Gale, Hazen F., *Seasonal Variation in Farm Food Prices and Price Spread*, Miscellaneous Publication No. 840, AMS, MERD, U.S. Department of Agriculture, Washington, D.C., January 1961.

1951-53 and 1960-62.<sup>2</sup> The peak seasonal price shifted from April to March, but the low remained in November. The 1963 seasonal pattern will be similar to that for the 1960-62 average.

**Veal calves.** The seasonal prices of veal calves during 1951-1962 were similar to those for beef cattle, with a peak normally occurring in April, a low normally occurring in November, and a reduction in the degree of variation (Table 2 and Figure 2). The peak seasonal price, however, shifted from April in 1951-53 to May in 1960-62. The 1963 projected indexes indicate that the peak and low will remain in May and November, respectively. There appears to be more stability (less variation) in recent years.

**Hogs.** Hog prices usually are highest in August and lowest in January (Table 3 and Figure 3). Two principal changes occurred in the seasonality of hog prices during the 1951-1962 period. First, the seasonal pattern changed significantly from 1951-53 to 1960-62. Second, there was a reduction in the degree of variation.

**Sheep and lambs.** Prices of Louisiana sheep and lambs show about the same typical seasonal pattern. The high prices of each are reached in late winter and early spring (Tables 4 and 5 and Figures 4 and 5). The seasonal pattern of sheep prices did not change very much over the 1951-1962 period. The seasonal pattern of lamb prices, however, changed significantly from 1951-53 to 1960-62. There was a reduction in the degree of variation for seasonal lamb prices from 1951 to 1962, but not for the seasonal prices of sheep.

**Wool.** There were several significant changes in the seasonal pattern of wool prices during the 1951-1962 period (Table 6 and Figure 6). On the average, the peak seasonal price is reached in July and the low in January. The 1963 seasonal indexes indicate that wool prices will rise to a peak in August. The 1963 projected indexes are not very reliable, as indicated by the high average irregular amplitude of 5.47 per cent.

**Eggs.** The seasonal pattern of price variation for eggs typically shows a December peak and a May low (Table 7 and Figure 7). There was no significant change in the seasonal pattern from 1951-53 to 1960-62, but the low shifted from April to June. The degree of variation in the seasonality of egg prices was much less in 1960-62 than in 1951-53. The seasonal prices in 1963 will decline from a high in January to a low in May or June and then rise continuously to December.

**Chickens.** During 1951-1962, prices received by Louisiana farmers for all chickens were usually highest in March and lowest in October (Table 8 and Figure 8). As seen in Table 8, the seasonal pattern changed significantly during this period. The 1960-62 seasonal indexes were inversely correlated with the 1951-53 indexes, indicating a highly significant change in the seasonal pattern. The degree of variation in the seasonal price increased considerably over this period. It is projected that the seasonal price of all chickens will be highest in February of 1963 and decline to a low in October.

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<sup>2</sup>A significant change in the seasonal pattern is indicated by a correlation coefficient less than .708, the value required for the 1 per cent level of probability.



The seasonal price movements of farm chickens and broilers are similar to those for all chickens (Tables 9 and 10 and Figures 9 and 10). There were several significant changes in the seasonal pattern during the 1951-1962 period, with the 1960-61 seasonal pattern being highly different from that of 1951-53. The major differences between the seasonality of farm chickens and broilers are: (1) The seasonal prices of farm chickens, on the average, show much less variation; and (2) the degree of variation in seasonal prices has increased much more for broilers than for farm chickens.

**Turkeys.** The seasonal pattern of turkey prices has also been similar to that of all chickens (Table 11 and Figure 11). Although there were several significant changes in the seasonal movements during 1951-1962, the degree of variation remained fairly constant.

**Milk.** On the average, wholesale milk prices rise continuously from June until a peak is reached in November and then decline to a low the following May or June (Table 12 and Figure 12). There was little change in the seasonal pattern over the 1951-1962 period, but the degree of variation in the seasonal indexes decreased slightly.

**Cotton.** The seasonal pattern of price variation for cotton in Louisiana typically shows a September peak and a January low, as indicated by the 1951-1962 average seasonal indexes (Table 13 and Figure 13). The principal changes in seasonality of cotton prices during this period were (1) a highly significant change in the seasonal pattern from 1951-53 to 1960-62; (2) an increase in the degree of variation; and (3) a shift in the seasonal highs from June to September and in the seasonal lows from December to March. The projected seasonal indexes for 1963 indicate that the high and low will again be in September and March, respectively.

**Rice.** On the average, rice prices rise moderately during the season beginning in August and reach a peak about the following March (Table 14 and Figure 14). The seasonal pattern of rice did not change significantly from 1951-53 to 1960-62. There was a reduction in the degree of variation from 1951-53 to 1960-62. The peak seasonal price shifted from February in 1951-53 to April in 1960-62, and the low shifted from September to August. The seasonal pattern in 1963 will be similar to that of 1960-62, with a high projected for April and a low projected for August.

**Sweet potatoes.** There is a high degree of variation in the seasonal movement of sweet potato prices. Sweet potato prices normally rise sharply from a low in October to a peak the following July (Table 15 and Figure 15). The seasonal pattern did not change significantly from 1951-53 to 1960-62. The degree of variation from 1951-53 to 1960-62 also remained about the same. The low seasonal price shifted from October to November, but the peak seasonal price remained in July. The 1963 seasonal movement will be similar to that of 1960-62, with a peak in June and a low in October. However, it must be noted that the seasonal price indexes for sweet potatoes are highly unreliable, as indicated by the extremely large irregular amplitude of 10.15 per cent.

**Soybeans.** The seasonal pattern of soybean prices in Louisiana typically shows a May peak and an October low, as indicated by the 1951-1962 average seasonal indexes (Table 16 and Figure 16). There was no significant change



in the seasonal pattern during this period, but there was a slight reduction in the degree of variation. The 1963 projected indexes indicate that the high will be in May and the low will be in September.

**Corn.** On the average, corn prices have risen moderately during the season beginning in October and have reached a peak about the following May (Table 17 and Figure 17). The seasonal movement did not change significantly from 1951-53 to 1960-62. The lowest seasonal price was in September in 1951-53, but shifted to October in 1960-62. The peak seasonal price shifted from May to June. The 1963 projected indexes indicate that corn prices will rise moderately from January to a peak in June and decline to a low in October.

**Wheat.** Wheat prices were first reported in 1957 for Louisiana. Since that time there has been little variation in the seasonal movements of wheat (Table 18 and Figure 18). The highest seasonal price was normally in January, but shifted to December by 1962. The low was usually in June, but shifted to July by 1962.

**Oats.** Prices received for oats in Louisiana normally reach a peak in November, remain close to this level through the following March, and then decline to a low in June (Table 19 and Figure 19). From 1951 to 1962 there was no significant change in the seasonal pattern. However, the peak price shifted from November-December to October, and there was a slight reduction in the degree of variation in the seasonal prices.

**Hay.** Prices of all hay are normally highest in the winter and lowest in the summer (Table 20 and Figure 20). The seasonal pattern in 1960-62 was not significantly different from that of 1951-53. The peak seasonal price shifted from March to January during this period and the low remained in July.

The seasonal prices of alfalfa hay and lespedeza hay follow the same pattern as that for all hay (Tables 21 and 22 and Figures 21 and 22). The seasonal pattern of lespedeza hay prices, however, changed significantly from 1951-53 to 1960-62.

**Grain sorghum.** Grain sorghum prices generally are highest from May to July and lowest from October to December (Table 23 and Figure 23). There was a significant change in the seasonal pattern from 1951-53 to 1960-62. There is less seasonal variation in grain sorghum prices than in other feed grains.

## Production

**Cattle and calves slaughtered.** The number of cattle and calves slaughtered in Louisiana normally reaches a peak in September-October and a low in February (Tables 24 and 25 and Figures 24 and 25). From 1951-53 to 1960-62, however, the peak shifted to August. Two differences are noted in the seasonal pattern of cattle slaughtered and calves slaughtered: (1) There was a reduction in the degree of variation for calves but not for cattle from 1951-53 to 1960-62; (2) the seasonal pattern of cattle changed significantly from 1951-53 to 1960-62, but the seasonal pattern of calves remained about the same.

**Hogs slaughtered.** On the average, the number of hogs slaughtered reaches a peak in December and a low in July (Table 26 and Figure 26). There was no significant change in the seasonal pattern from 1951-53 to 1960-62. But there was a large reduction in the degree of variation between these two time periods.

**Poultry and eggs.** The seasonal patterns of egg production, eggs per 100 layers, and number of layers did not change significantly during the 1951-1962 period (Tables 27, 28, and 29 and Figures 27, 28, and 29). Egg production and eggs per 100 layers are normally highest in March or April and lowest from November to January. There have been large reductions in the degree of variation of the seasonal indexes of eggs. The number of layers is usually highest in December or January and lowest in June or July.

## **Livestock-Feed Price Ratios**

The seasonal movements of the cattle-corn, calf-corn, and hog-corn ratios are shown in Tables 30 through 32 and Figures 30 through 32. These ratios serve as guides in determining whether to sell corn or feed it to cattle, calves, and hogs. High ratios indicate that it is more profitable to feed the corn. Conversely, low ratios indicate that it is more profitable to sell the corn.

The cattle-corn and calf-corn ratios typically reach a peak about April and a low about July. There were several significant changes in the seasonal patterns of these two ratios during the 1951-1962 period. The peaks for these two ratios shifted to January-February and the lows shifted to June.

The hog-corn ratio normally reaches its peak in September-October and its low in March. The seasonal pattern changed significantly from 1951-53 to 1960-62. The peak shifted from August to October during the 1951-1962 period and the low shifted from February to June.

The 1963 projected seasonal indexes indicate that the peak will occur in January-February and the low in June-July for the cattle-corn and calf-corn ratios. The projected indexes for the hog-corn ratio indicate the peak will occur in October and the low in June.

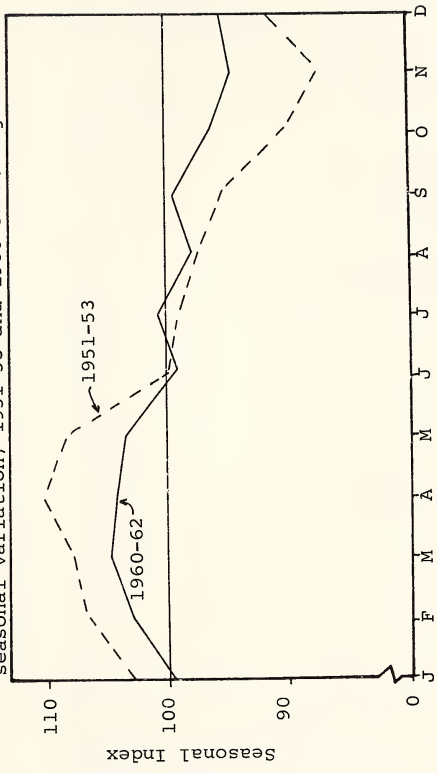
Table 1. Beef cattle prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug. | Sept. | Oct. | Nov. | Dec. |
|----------------------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|------|------|
| 1951-62 <sup>1</sup> | 99.9  | 104.0 | 105.7 | 106.8 | 106.0 | 100.5 | 99.9  | 98.3 | 97.9  | 95.0 | 92.1 | 93.9 |
| 1951-53              | 102.7 | 106.7 | 108.0 | 110.1 | 108.3 | 100.5 | 99.2  | 97.5 | 95.9  | 91.7 | 87.9 | 91.6 |
| 1960-62 <sup>2</sup> | 99.3  | 103.0 | 104.8 | 104.2 | 103.8 | 99.8  | 100.6 | 97.9 | 99.3  | 96.7 | 94.8 | 95.9 |
| 1963                 | 100.5 | 104.0 | 104.4 | 102.8 | 103.6 | 98.3  | 100.4 | 97.7 | 100.0 | 96.9 | 94.7 | 96.7 |

Average irregular amplitude = 1.69. Average amplitudes are average month-to month percentage changes, disregarding direction of change. The magnitude of the irregular amplitudes enables us to judge the importance and "predictability" of the seasonal index. The irregular amplitudes are also shown in footnote 1 in Tables 2 through 32.

$2r = .963$ , the correlation coefficient between the 1951-53 and 1960-62 average seasonal indexes. An  $r$  value  $\leq .708$  indicates a significant difference in the seasonal pattern for these two time periods. The  $r$  values are also shown in footnote 2 in Tables 2 through 32.

Figure 1. Beef cattle prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages



Note: In comparing the seasonal movements for the 1951-53 average and the 1960-62 average, note the following: (1) Change in pattern; that is, the movements up and down between months; (2) Shifts in peaks and lows between the two periods; and (3) Change in the degree of variation between the two periods. The same comparisons can be made for Figures 2 through 32.

| Table 2. Veal calf prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected |       |       |       |       |       |       |       |      |       |      |      |       |
|----------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|------|-------|
| Year                                                                                         | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug. | Sept. | Oct. | Nov. | Dec.  |
| 1951-62 <sup>1</sup>                                                                         | 100.9 | 103.5 | 104.6 | 106.5 | 106.4 | 101.8 | 101.3 | 98.6 | 96.3  | 93.6 | 91.7 | 94.8  |
| 1951-53                                                                                      | 103.5 | 106.9 | 106.7 | 108.3 | 107.4 | 102.5 | 101.2 | 99.4 | 93.2  | 89.6 | 88.2 | 93.1  |
| 1960-62 <sup>2</sup>                                                                         | 100.5 | 102.0 | 103.0 | 104.4 | 105.0 | 99.9  | 100.7 | 96.8 | 97.9  | 96.0 | 95.1 | 98.4  |
| 1963                                                                                         | 102.2 | 102.6 | 103.2 | 103.5 | 103.8 | 98.1  | 98.8  | 96.4 | 98.6  | 97.0 | 95.6 | 100.2 |

<sup>1</sup>Average irregular amplitude = 1.70.

<sup>2</sup>r = .917.

Figure 2. Veal calf prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

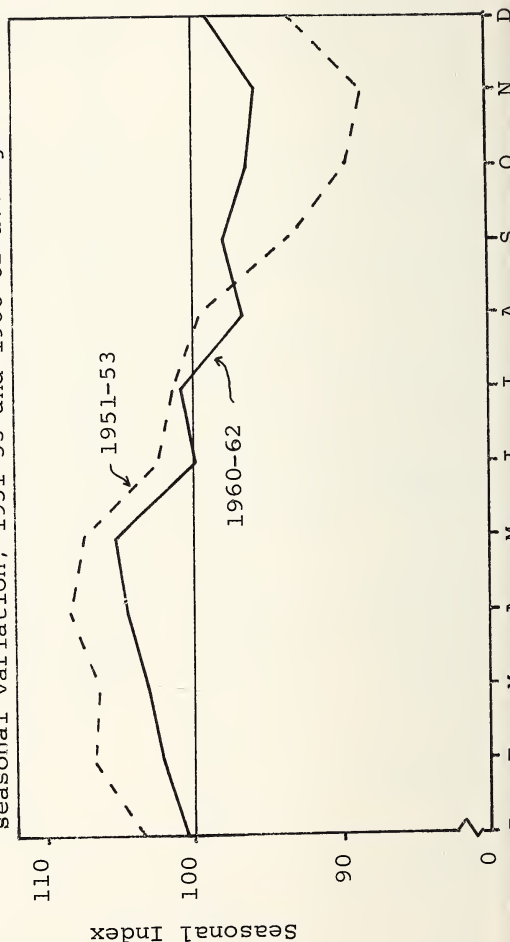




Table 3. Hog prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb. | Mar. | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 94.7 | 96.9 | 97.3 | 100.0 | 101.7 | 102.9 | 104.0 | 104.4 | 102.7 | 100.8 | 98.7  | 95.9  |
| 1951-53              | 94.8 | 96.8 | 97.3 | 98.4  | 102.6 | 103.8 | 104.8 | 106.5 | 102.4 | 100.8 | 98.2  | 93.7  |
| 1960-62 <sup>2</sup> | 95.7 | 96.4 | 99.4 | 100.3 | 100.3 | 98.9  | 101.6 | 102.3 | 102.3 | 101.7 | 101.4 | 99.7  |
| 1963                 | 98.0 | 97.2 | 99.5 | 99.1  | 99.1  | 97.2  | 100.8 | 101.6 | 103.2 | 102.3 | 101.1 | 100.7 |

<sup>1</sup>Average irregular amplitude = 1.96

<sup>2</sup>r = .623

Figure 3. Hog prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

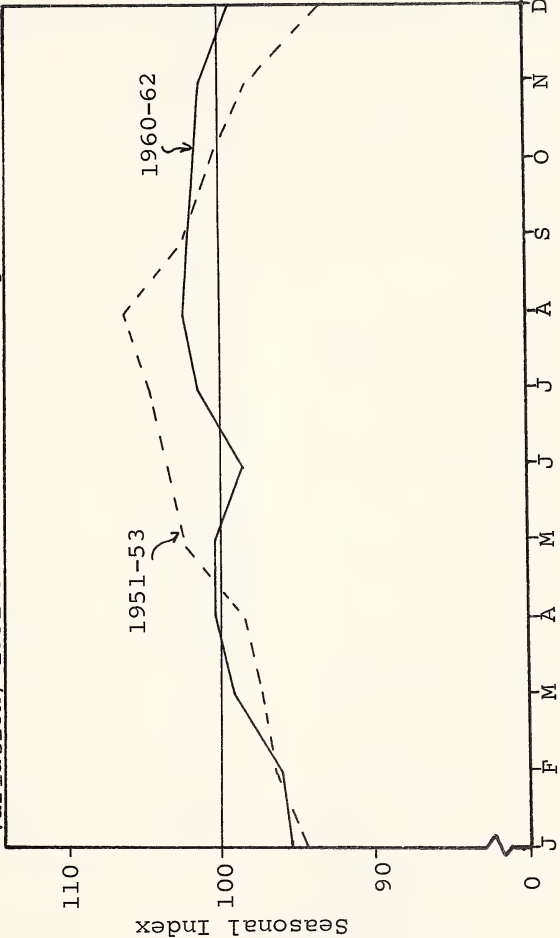


Table 4. Sheep prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June | July | Aug. | Sept. | Oct. | Nov. | Dec.  |
|----------------------|-------|-------|-------|-------|-------|------|------|------|-------|------|------|-------|
| 1951-62 <sup>1</sup> | 102.7 | 103.1 | 104.8 | 105.5 | 103.8 | 98.9 | 97.4 | 96.3 | 95.4  | 95.3 | 97.8 | 98.9  |
| 1951-53              | 104.4 | 104.3 | 106.4 | 105.0 | 106.3 | 96.8 | 95.9 | 95.9 | 96.5  | 93.9 | 96.6 | 98.0  |
| 1960-62 <sup>2</sup> | 103.0 | 105.0 | 105.9 | 104.6 | 100.9 | 97.9 | 98.1 | 95.2 | 95.4  | 95.9 | 97.8 | 100.2 |
| 1963                 | 103.1 | 106.9 | 106.9 | 104.8 | 99.9  | 98.3 | 98.7 | 94.1 | 94.5  | 95.4 | 97.2 | 100.0 |

<sup>1</sup>Average irregular amplitude = 1.95

<sup>2</sup> $r = .901$

Figure 4. Sheep prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

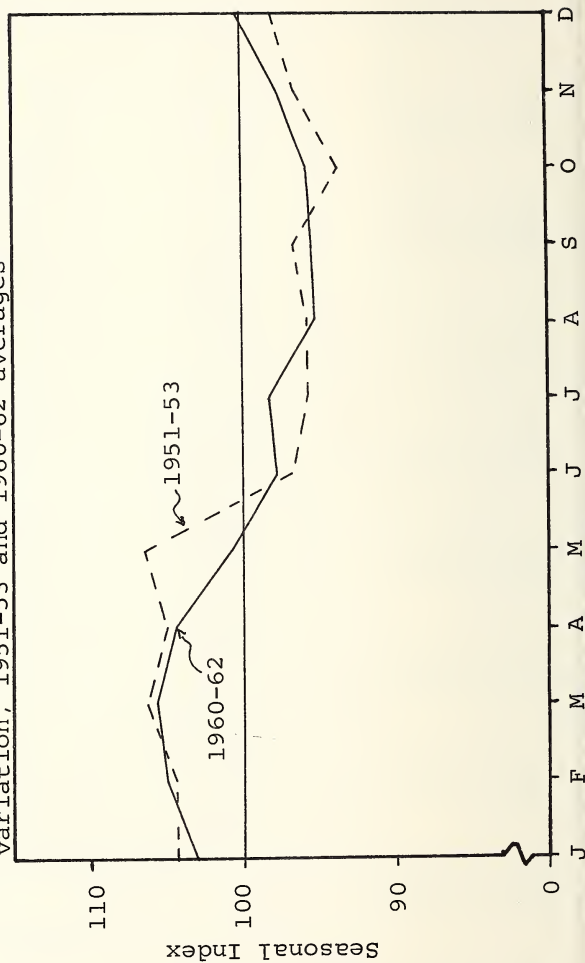


Table 5. Lamb prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct. | Nov. | Dec. |
|----------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|
| 1951-62 <sup>1</sup> | 98.0 | 100.3 | 102.7 | 104.1 | 103.0 | 102.3 | 101.8 | 100.6 | 98.9  | 96.6 | 96.5 | 95.2 |
| 1951-53              | 99.2 | 102.5 | 104.7 | 104.2 | 103.6 | 101.6 | 103.8 | 101.2 | 99.4  | 92.9 | 93.3 | 93.7 |
| 1960-62 <sup>2</sup> | 98.1 | 98.8  | 101.0 | 102.6 | 100.6 | 103.0 | 100.5 | 101.1 | 100.2 | 98.6 | 98.2 | 97.5 |
| 1963                 | 98.4 | 99.2  | 100.9 | 103.6 | 98.6  | 103.3 | 99.3  | 101.9 | 101.3 | 98.4 | 97.4 | 97.6 |

<sup>1</sup>Average irregular amplitude = 1.87

<sup>2</sup>r = .716

Figure 5. Lamb prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

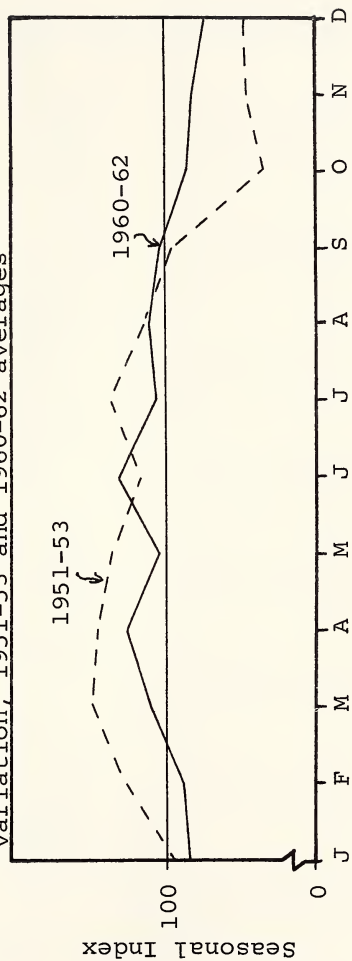


Table 6. Wool prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb.  | Mar. | Apr. | May  | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|------|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 94.7 | 98.3  | 96.1 | 97.1 | 98.2 | 98.9  | 108.9 | 100.5 | 101.3 | 99.6  | 105.5 | 100.9 |
| 1951-53              | 98.0 | 97.6  | 99.0 | 99.5 | 97.6 | 101.2 | 111.4 | 98.0  | 97.7  | 100.1 | 100.1 | 99.8  |
| 1960-62 <sup>2</sup> | 90.5 | 98.7  | 91.6 | 96.3 | 97.5 | 101.7 | 109.4 | 108.7 | 101.2 | 99.0  | 101.7 | 103.8 |
| 1963                 | 87.5 | 100.0 | 96.4 | 95.6 | 96.7 | 99.6  | 107.5 | 110.9 | 101.0 | 98.1  | 101.4 | 105.3 |

<sup>1</sup>Average irregular amplitude = 5.47<sup>2</sup> $r = .527$ 

Figure 6. Wool prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

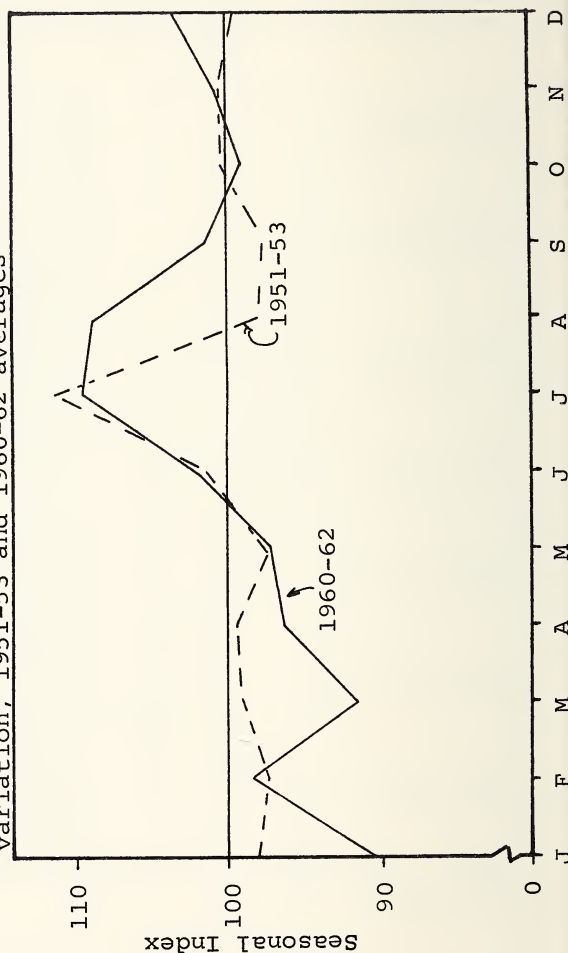




Table 7. Egg prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar. | Apr. | May  | June | July | Aug.  | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|-------|-------|------|------|------|------|------|-------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 113.4 | 101.6 | 89.8 | 87.1 | 84.8 | 86.1 | 91.2 | 97.6  | 103.9 | 110.5 | 113.9 | 120.2 |
| 1951-53              | 114.2 | 94.0  | 80.1 | 79.4 | 79.9 | 83.5 | 91.7 | 100.5 | 108.4 | 117.1 | 121.8 | 129.3 |
| 1960-62 <sup>2</sup> | 112.0 | 105.0 | 96.1 | 92.9 | 88.7 | 88.2 | 91.1 | 95.5  | 101.5 | 107.2 | 108.7 | 113.1 |
| 1963                 | 113.0 | 106.6 | 96.8 | 92.8 | 88.8 | 88.8 | 90.9 | 96.4  | 102.7 | 105.5 | 107.2 | 110.3 |

<sup>1</sup>Average irregular amplitude = 2.06       $2r = .882$

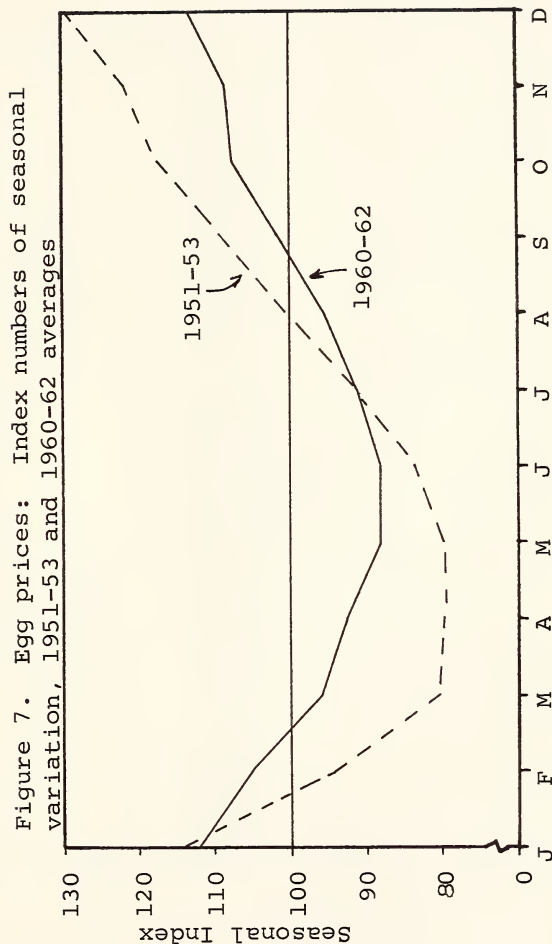


Table 8. Chicken prices (all): Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct. | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| 1951-62 <sup>1</sup> | 101.3 | 103.4 | 106.2 | 101.3 | 101.4 | 101.6 | 102.0 | 100.9 | 97.2  | 93.7 | 95.7  | 95.3  |
| 1951-53              | 100.0 | 97.7  | 98.8  | 97.0  | 96.2  | 98.1  | 102.9 | 105.3 | 104.5 | 99.4 | 101.1 | 99.1  |
| 1960-62 <sup>2</sup> | 108.5 | 114.8 | 112.4 | 104.9 | 100.9 | 96.6  | 94.5  | 94.4  | 91.8  | 89.2 | 91.7  | 100.2 |
| 1963                 | 110.9 | 119.5 | 115.1 | 106.0 | 98.8  | 92.5  | 91.0  | 94.5  | 92.9  | 88.2 | 91.2  | 99.4  |

Average irregular amplitude = 2.83

 $2r = -.536$ 

Figure 8. Chicken prices (all): Index numbers of seasonal variation, 1951-53 and 1960-62 averages

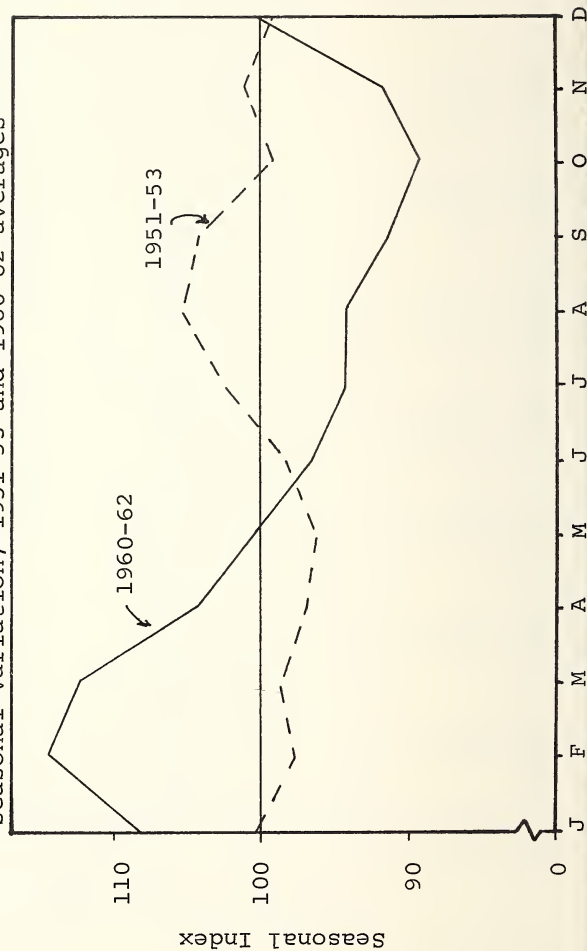


Table 9. Farm chicken prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June | July | Aug.  | Sept. | Oct. | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|-------|------|------|-------|-------|------|-------|-------|
| 1951-62 <sup>1</sup> | 100.8 | 101.1 | 101.2 | 101.5 | 101.3 | 99.2 | 98.8 | 99.0  | 98.0  | 98.9 | 99.8  | 100.2 |
| 1951-53              | 102.6 | 99.5  | 99.6  | 98.6  | 100.4 | 98.3 | 97.1 | 100.6 | 99.3  | 99.8 | 103.0 | 101.0 |
| 1960-62 <sup>2</sup> | 102.8 | 104.3 | 103.6 | 104.1 | 102.8 | 98.9 | 96.4 | 96.3  | 94.7  | 96.9 | 98.3  | 100.8 |
| 1963                 | 104.3 | 105.2 | 103.8 | 104.8 | 105.7 | 98.9 | 93.4 | 95.3  | 95.9  | 95.0 | 97.4  | 100.0 |

<sup>1</sup>Average irregular amplitude = 2.45  
<sup>2</sup>r = .142

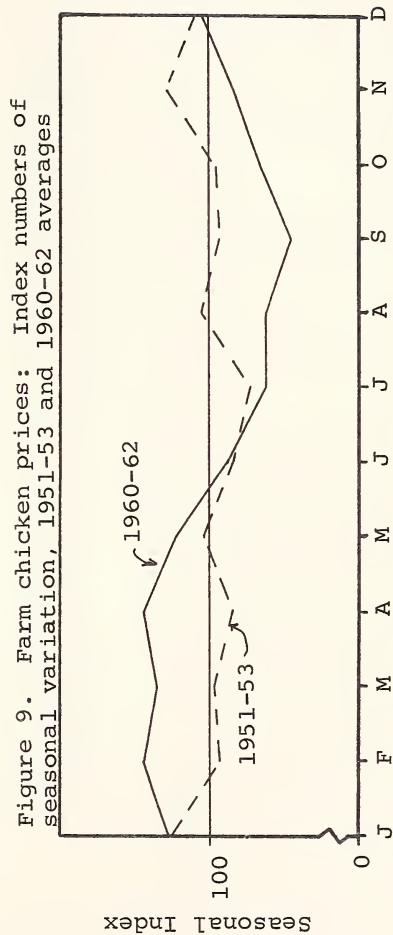


Table 10. Commercial broiler prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct. | Nov. | Dec.  |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|
| 1951-62 <sup>1</sup> | 101.1 | 103.5 | 106.5 | 101.0 | 100.6 | 101.4 | 102.8 | 101.8 | 97.8  | 93.4 | 94.8 | 95.3  |
| 1951-53              | 100.0 | 97.9  | 98.7  | 95.8  | 93.9  | 97.7  | 104.8 | 107.3 | 106.7 | 99.2 | 99.1 | 98.9  |
| 1960-62 <sup>2</sup> | 108.2 | 115.5 | 113.1 | 104.9 | 100.0 | 95.9  | 94.4  | 95.1  | 91.8  | 88.6 | 90.9 | 101.5 |
| 1963                 | 111.3 | 120.5 | 116.0 | 105.8 | 98.0  | 92.1  | 90.9  | 94.7  | 92.7  | 87.6 | 90.3 | 100.0 |

Average irregular amplitude = 3.16

 $2r = -.404$ 

Figure 10. Commercial broiler prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

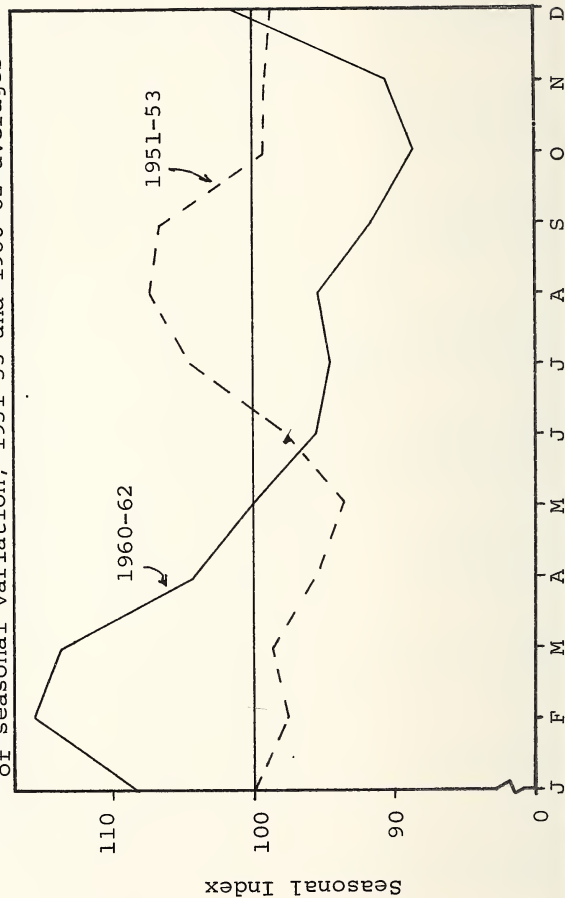




Table 11. Turkey prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June | July | Aug. | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|-------|------|------|------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 102.0 | 101.0 | 101.4 | 101.6 | 100.2 | 97.8 | 98.2 | 97.7 | 98.1  | 100.3 | 99.5  | 102.1 |
| 1951-53              | 104.0 | 102.1 | 99.8  | 100.1 | 98.1  | 96.0 | 95.6 | 95.9 | 98.1  | 104.6 | 102.3 | 103.3 |
| 1960-62 <sup>2</sup> | 103.2 | 101.3 | 104.6 | 105.0 | 101.7 | 98.2 | 98.2 | 96.4 | 96.1  | 95.7  | 98.4  | 101.4 |
| 1963                 | 106.1 | 101.8 | 107.3 | 107.8 | 100.5 | 97.6 | 97.7 | 95.0 | 95.1  | 94.3  | 98.2  | 98.0  |

<sup>1</sup>Average irregular amplitude = 2.18      <sup>2</sup>r = .254

Figure 11. Turkey prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

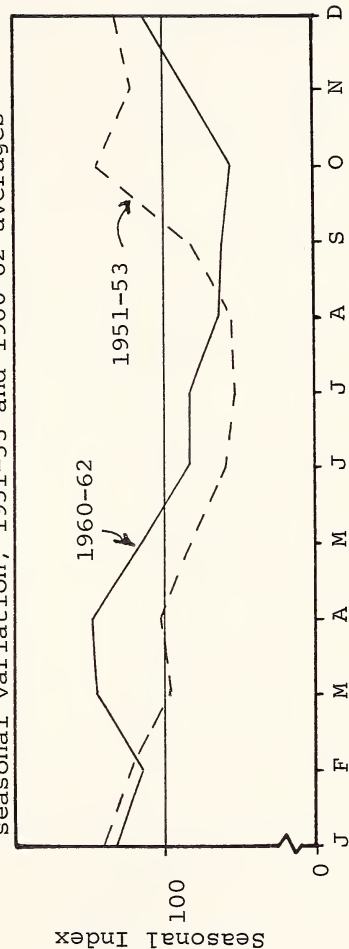


Table 12. Wholesale milk prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar. | Apr. | May  | June | July | Aug. | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|-------|-------|------|------|------|------|------|------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 104.7 | 102.8 | 97.7 | 94.4 | 94.2 | 93.8 | 95.7 | 97.6 | 102.0 | 104.9 | 106.8 | 105.3 |
| 1951-53              | 103.9 | 101.6 | 97.1 | 93.9 | 93.4 | 93.4 | 94.6 | 97.4 | 102.1 | 106.1 | 108.9 | 107.8 |
| 1960-62              | 105.8 | 103.9 | 98.4 | 96.0 | 95.6 | 96.2 | 96.9 | 97.1 | 100.2 | 102.8 | 104.3 | 102.8 |
| 1963                 | 106.1 | 103.6 | 98.7 | 97.5 | 96.5 | 97.3 | 96.2 | 96.9 | 99.5  | 102.2 | 104.0 | 101.5 |

<sup>1</sup>Average irregular amplitude = 1.13 $2r = .899$ 

Figure 12. Wholesale milk prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

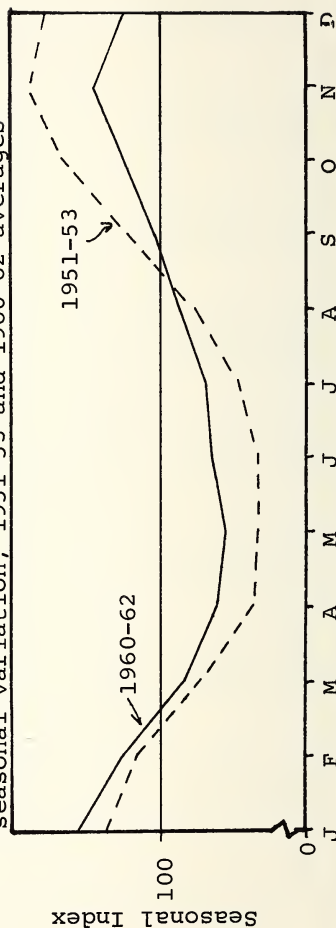


Table 13. Cotton prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar. | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 97.2  | 97.7  | 98.4 | 99.3  | 100.4 | 101.0 | 100.8 | 102.6 | 104.1 | 101.2 | 99.6  | 97.7  |
| 1951-53              | 100.7 | 100.9 | 99.9 | 100.8 | 99.7  | 101.6 | 100.5 | 98.7  | 100.1 | 98.8  | 99.8  | 98.5  |
| 1960-62              | 95.9  | 95.1  | 95.0 | 97.1  | 100.1 | 100.9 | 100.9 | 103.8 | 105.2 | 104.2 | 101.9 | 99.9  |
| 1963                 | 96.1  | 94.5  | 93.2 | 95.2  | 100.9 | 101.5 | 101.4 | 104.6 | 105.1 | 104.0 | 102.7 | 100.9 |

<sup>1</sup>Average irregular amplitude = 1.52       $2r = -.439$

Figure 13. Cotton prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

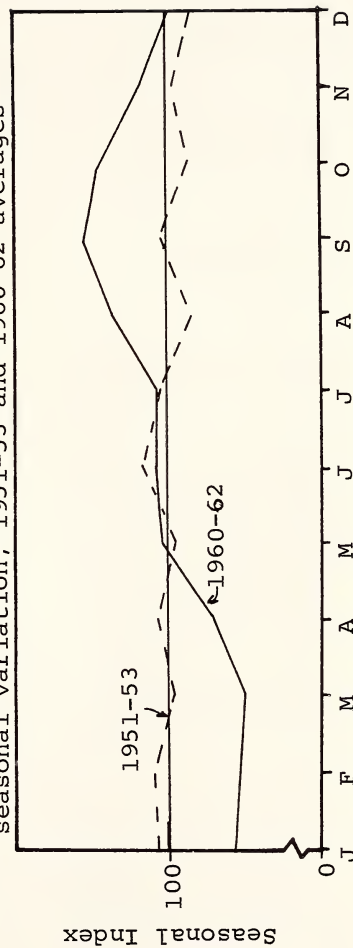


Table 14. Rice prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July | Aug. | Sept. | Oct. | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|-------|-------|------|------|-------|------|-------|-------|
| 1951-62 <sup>1</sup> | 102.2 | 103.6 | 103.7 | 103.5 | 101.8 | 100.7 | 98.0 | 91.5 | 93.2  | 99.5 | 100.7 | 101.6 |
| 1951-53              | 104.4 | 104.7 | 104.2 | 104.1 | 104.4 | 102.9 | 99.5 | 89.5 | 86.7  | 96.6 | 99.6  | 103.3 |
| 1960-62 <sup>2</sup> | 101.8 | 103.7 | 103.6 | 104.3 | 101.0 | 101.3 | 99.8 | 90.8 | 92.7  | 98.5 | 101.7 | 100.9 |
| 1963                 | 101.7 | 103.1 | 104.7 | 105.2 | 101.1 | 100.5 | 98.9 | 89.9 | 92.0  | 99.1 | 101.9 | 101.8 |

Average irregular amplitude = 1.80

 $2r = .941$ 

Figure 14. Rice prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

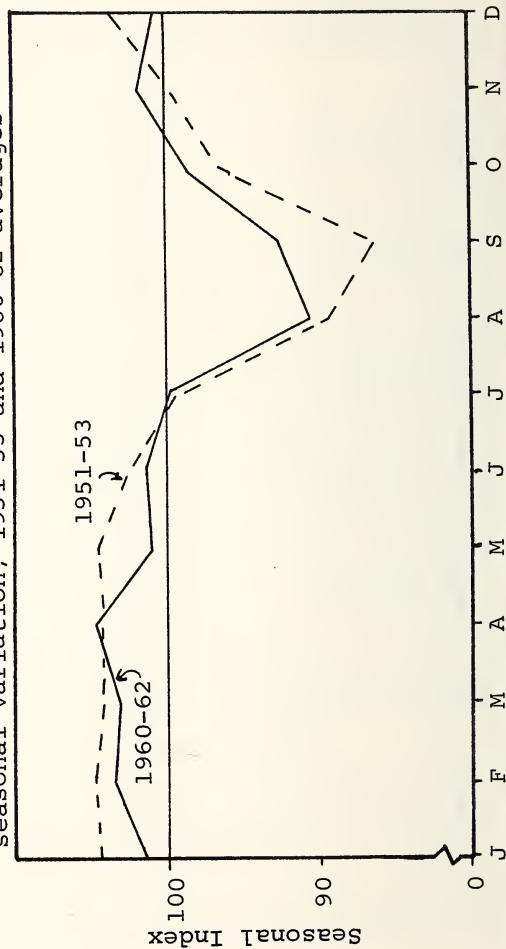




Table 15. Sweet potato prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug. | Sept. | Oct. | Nov. | Dec.  |
|----------------------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|------|-------|
| 1951-62 <sup>1</sup> | 105.2 | 105.6 | 109.0 | 113.8 | 112.3 | 112.5 | 130.3 | 88.2 | 76.6  | 69.6 | 75.0 | 101.8 |
| 1951-53              | 94.3  | 99.3  | 109.0 | 122.0 | 119.5 | 114.4 | 126.6 | 89.5 | 75.5  | 71.3 | 80.1 | 98.5  |
| 1960-62              | 104.0 | 103.8 | 108.9 | 112.7 | 114.9 | 117.5 | 123.9 | 96.4 | 80.0  | 72.2 | 70.9 | 95.0  |
| 1963                 | 98.6  | 104.6 | 113.1 | 119.1 | 123.6 | 128.9 | 112.2 | 93.8 | 79.0  | 70.3 | 72.7 | 83.9  |

<sup>1</sup>Average irregular amplitude = 10.15                       $2r = .946$

Figure 15. Sweet potato prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

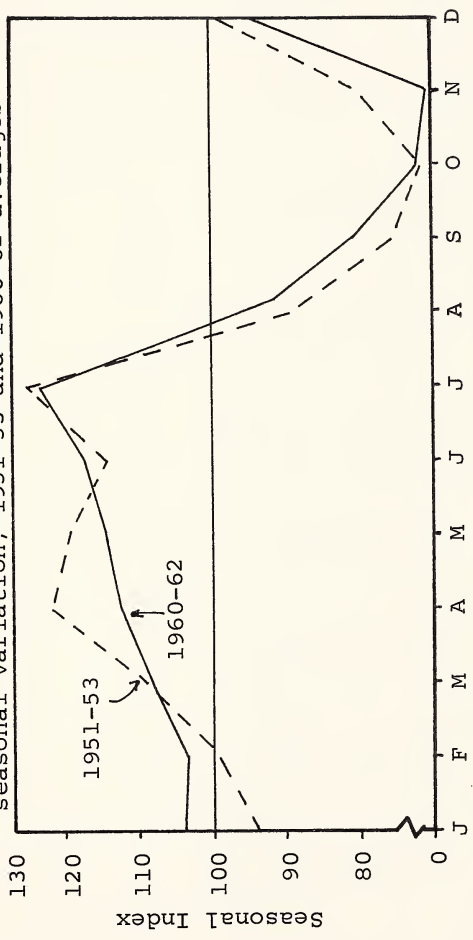


Table 16. Soybean prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb. | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct. | Nov. | Dec.  |
|----------------------|------|------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|
| 1951-62 <sup>1</sup> | 96.4 | 99.1 | 103.8 | 108.6 | 109.7 | 107.0 | 103.5 | 99.9  | 92.6  | 91.8 | 93.1 | 94.5  |
| 1951-53              | 95.5 | 98.8 | 104.8 | 108.7 | 109.2 | 109.7 | 105.6 | 100.7 | 91.7  | 89.9 | 91.7 | 93.6  |
| 1960-62 <sup>2</sup> | 97.8 | 98.8 | 102.2 | 105.8 | 105.9 | 101.6 | 101.6 | 99.8  | 95.1  | 95.2 | 97.7 | 98.4  |
| 1963                 | 97.7 | 98.7 | 103.0 | 105.0 | 105.5 | 100.8 | 101.1 | 99.7  | 94.1  | 94.9 | 98.5 | 101.1 |

<sup>1</sup>Average irregular amplitude = 2.22

<sup>2</sup>r = .921

Figure 16. Soybean prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

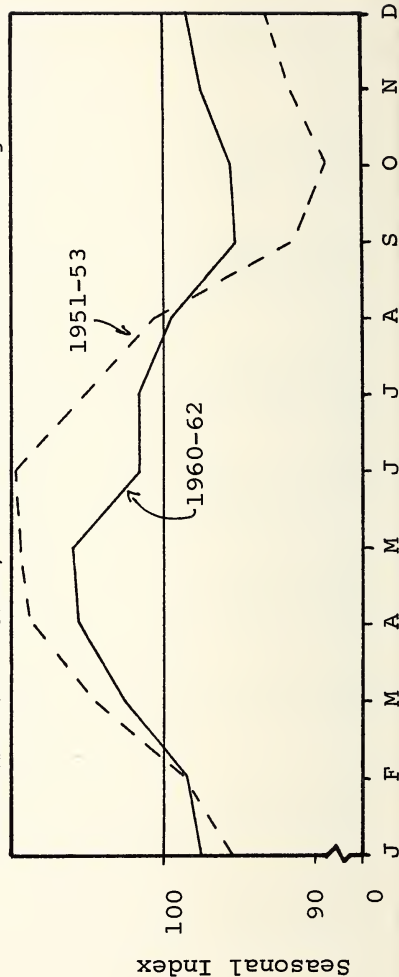


Table 17. Corn prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct. | Nov. | Dec. |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|
| 1951-62 <sup>1</sup> | 98.5  | 101.0 | 103.0 | 103.4 | 104.6 | 103.8 | 102.7 | 100.4 | 96.4  | 94.7 | 95.0 | 96.5 |
| 1951-53              | 100.3 | 103.7 | 103.0 | 104.5 | 105.0 | 102.8 | 100.6 | 97.3  | 94.6  | 94.9 | 95.3 | 97.9 |
| 1960-62 <sup>2</sup> | 98.0  | 99.6  | 102.8 | 102.8 | 103.1 | 104.2 | 102.2 | 101.1 | 97.4  | 95.5 | 95.7 | 97.5 |
| 1963                 | 98.0  | 99.8  | 101.9 | 102.0 | 102.6 | 104.5 | 101.3 | 101.3 | 97.4  | 95.6 | 96.2 | 99.3 |

Average irregular amplitude = 1.42

 $2r = .817$ 

Figure 17. Corn prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

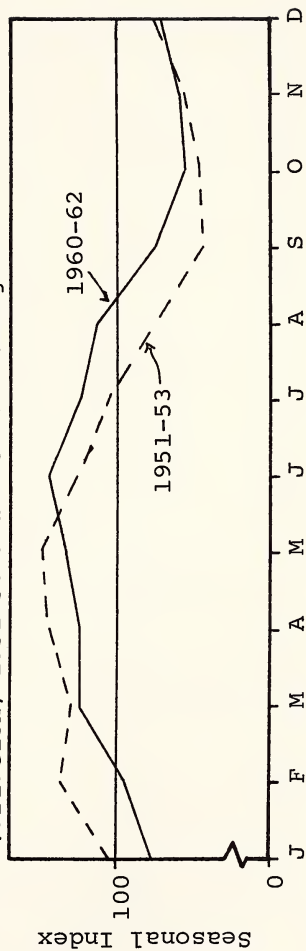


Table 18. Wheat prices: Index numbers of seasonal variation, 1957-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June | July | Aug.  | Sept. | Oct. | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|-------|------|------|-------|-------|------|-------|-------|
| 1957-62 <sup>1</sup> | 102.4 | 101.4 | 101.1 | 101.5 | 101.8 | 99.9 | 96.6 | 97.2  | 99.0  | 99.3 | 100.2 | 101.6 |
| 1957-59              | 103.8 | 101.6 | 101.7 | 102.2 | 100.2 | 95.7 | 96.9 | 98.7  | 99.2  | 99.3 | 99.8  | 101.1 |
| 1960-62 <sup>2</sup> | 101.1 | 100.8 | 101.4 | 101.4 | 99.6  | 97.5 | 97.4 | 99.3  | 99.7  | 99.2 | 100.5 | 102.1 |
| 1963                 | 100.3 | 100.8 | 100.2 | 99.8  | 98.3  | 99.4 | 98.7 | 100.1 | 99.8  | 98.5 | 100.7 | 103.4 |

Average irregular amplitude = 1.15

 $2r = .893$ 

Figure 18. Wheat prices: Index numbers of seasonal variation, 1957-59 and 1960-62 averages

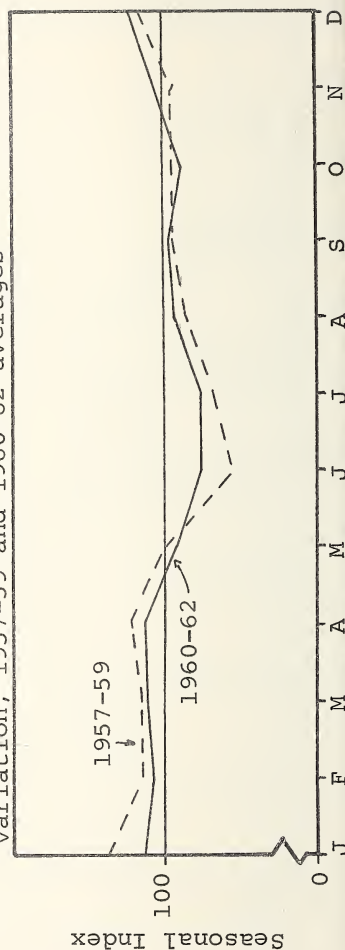




Table 19. Oat prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|          | Jan.  | Feb.  | Mar.  | Apr.  | May  | June | July | Aug. | Sept. | Oct.  | Nov.  | Dec.  |
|----------|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|-------|
| 1951-621 | 105.1 | 104.7 | 104.4 | 100.7 | 98.7 | 88.4 | 90.6 | 94.8 | 99.6  | 103.9 | 104.6 | 104.3 |
| 1951-53  | 106.5 | 107.2 | 105.9 | 99.9  | 97.9 | 86.7 | 88.1 | 91.5 | 98.4  | 102.4 | 107.7 | 107.8 |
| 1960-622 | 102.6 | 103.1 | 102.6 | 99.4  | 98.8 | 93.5 | 94.5 | 98.3 | 99.4  | 105.3 | 101.3 | 101.0 |
| 1963     | 102.6 | 101.9 | 103.0 | 99.2  | 99.6 | 94.6 | 94.8 | 98.1 | 98.7  | 105.9 | 100.6 | 101.2 |

1Average irregular amplitude = 2.27  $2r = .871$

Figure 19. Oat prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

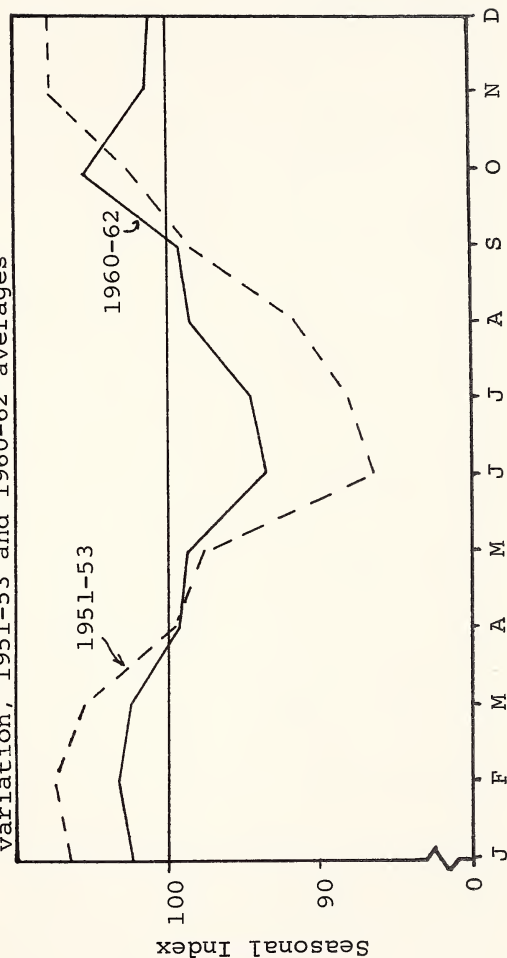


Table 20. All hay prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May  | June | July | Aug. | Sept. | Oct. | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|------|------|------|------|-------|------|-------|-------|
| 1951-62 <sup>1</sup> | 106.7 | 104.5 | 105.0 | 100.9 | 97.7 | 95.4 | 94.8 | 95.6 | 96.7  | 98.0 | 101.1 | 103.4 |
| 1951-53              | 109.2 | 102.0 | 107.1 | 100.2 | 96.7 | 92.7 | 92.1 | 96.6 | 95.5  | 98.9 | 103.8 | 105.1 |
| 1960-62 <sup>2</sup> | 105.2 | 102.8 | 101.8 | 101.0 | 96.6 | 97.9 | 97.3 | 97.7 | 99.5  | 97.6 | 100.2 | 102.5 |
| 1963                 | 106.7 | 101.8 | 97.5  | 100.6 | 97.7 | 98.5 | 95.2 | 98.7 | 101.8 | 98.7 | 100.7 | 102.0 |

Average irregular amplitude = 2.64

 $2r = .853$ 

Figure 20. All hay prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

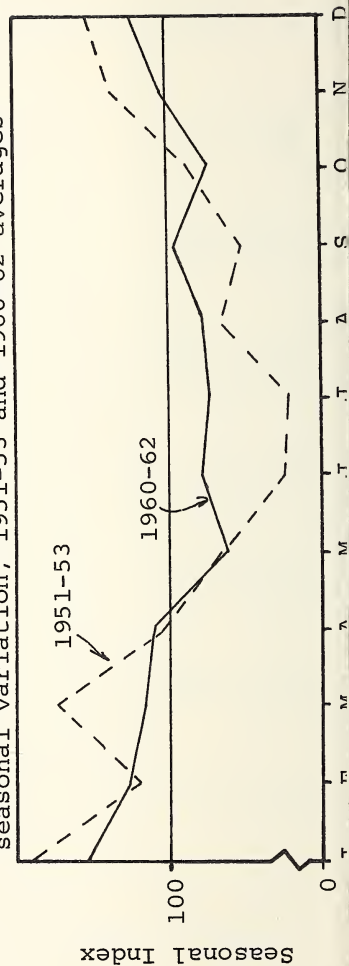


Table 21. Alfalfa hay prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May  | June | July | Aug. | Sept. | Oct. | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|------|------|------|------|-------|------|-------|-------|
| 1951-62 <sup>1</sup> | 108.1 | 108.7 | 105.9 | 101.4 | 98.1 | 93.5 | 93.0 | 92.7 | 94.7  | 97.5 | 101.4 | 105.1 |
| 1951-53              | 112.8 | 111.6 | 105.7 | 100.4 | 96.2 | 89.2 | 89.4 | 91.3 | 95.1  | 98.7 | 103.5 | 106.2 |
| 1960-62 <sup>2</sup> | 103.6 | 104.9 | 103.4 | 101.8 | 96.1 | 97.1 | 97.5 | 96.3 | 97.5  | 97.6 | 100.8 | 103.4 |
| 1963                 | 103.1 | 104.4 | 100.1 | 101.7 | 95.5 | 97.6 | 97.2 | 98.0 | 99.6  | 98.5 | 100.1 | 104.0 |

<sup>1</sup>Average irregular amplitude = 2.43                      <sup>2</sup>r = .907

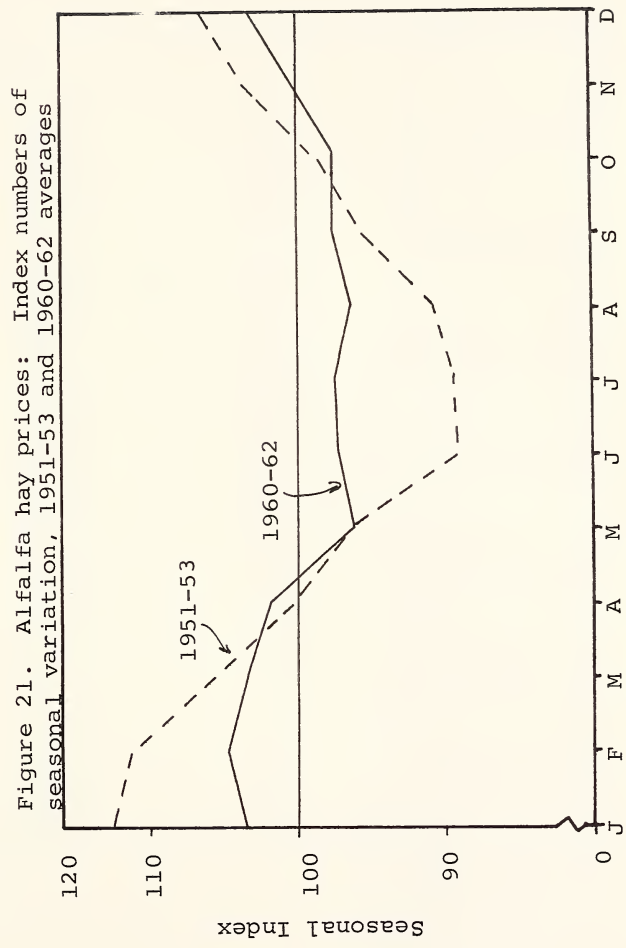


Table 22. Lespedeza hay prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May  | June  | July  | Aug. | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 105.0 | 104.0 | 104.8 | 100.2 | 96.8 | 96.5  | 97.7  | 96.4 | 95.9  | 99.1  | 101.9 | 101.2 |
| 1951-53              | 107.9 | 106.7 | 106.7 | 100.3 | 96.4 | 92.6  | 92.2  | 96.7 | 92.7  | 98.4  | 104.4 | 105.0 |
| 1960-62 <sup>2</sup> | 102.3 | 100.5 | 103.4 | 101.5 | 95.7 | 99.6  | 101.1 | 98.5 | 99.3  | 99.6  | 100.8 | 97.9  |
| 1963                 | 102.5 | 99.6  | 100.3 | 101.9 | 96.3 | 100.6 | 100.4 | 98.5 | 101.3 | 100.7 | 100.7 | 97.2  |

<sup>1</sup>Average irregular amplitude = 3.23      <sup>2</sup>r = .432

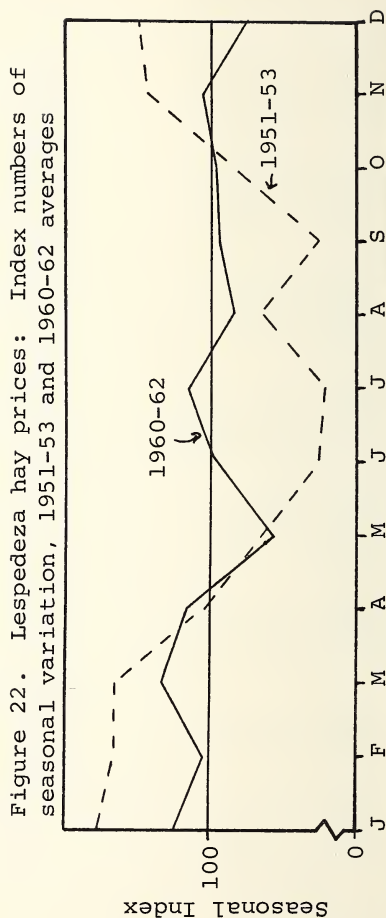




Table 23. Grain sorghum prices: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|          | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct. | Nov. | Dec. |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|
| 1951-621 | 98.8  | 99.2  | 101.1 | 102.5 | 103.7 | 103.0 | 104.1 | 101.6 | 97.9  | 94.9 | 95.4 | 97.5 |
| 1951-53  | 100.8 | 100.3 | 100.9 | 100.8 | 102.0 | 99.5  | 100.7 | 101.8 | 100.3 | 96.5 | 97.4 | 99.0 |
| 1960-622 | 98.2  | 99.2  | 101.6 | 103.0 | 103.8 | 103.6 | 104.0 | 99.9  | 96.9  | 95.6 | 96.1 | 98.0 |
| 1963     | 98.0  | 98.9  | 101.5 | 102.6 | 103.2 | 102.5 | 103.3 | 99.1  | 98.4  | 96.7 | 96.7 | 99.0 |

Average irregular amplitude = 1.21

 $2r = .656$ 

Figure 23. Grain sorghum prices: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

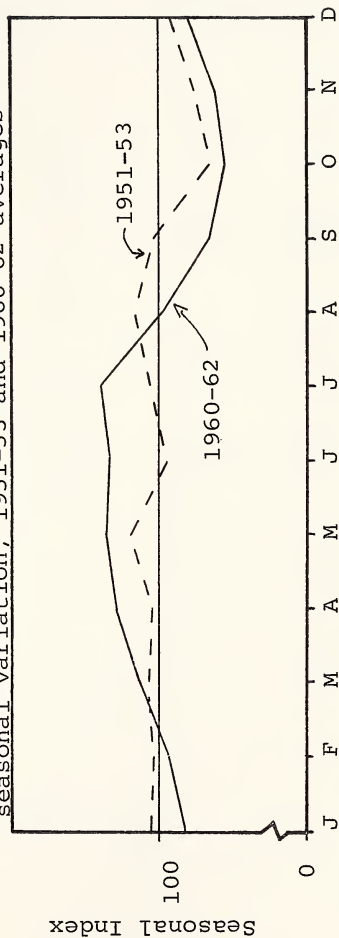


Table 24. Cattle slaughtered: Index numbers of seasonal variation, 1951-1962, and 1963 projected

|                      | Jan.  | Feb. | Mar. | Apr. | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec. |
|----------------------|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|------|
| 1951-62 <sup>1</sup> | 102.9 | 81.7 | 87.3 | 87.7 | 98.9  | 105.4 | 109.8 | 109.6 | 106.6 | 112.8 | 105.0 | 92.3 |
| 1951-53              | 112.0 | 88.2 | 92.7 | 83.7 | 90.2  | 93.5  | 101.1 | 105.5 | 106.8 | 120.1 | 111.1 | 95.0 |
| 1960-62 <sup>2</sup> | 100.0 | 80.3 | 87.1 | 85.9 | 105.1 | 109.4 | 114.8 | 116.0 | 105.8 | 108.3 | 99.8  | 87.6 |
| 1963                 | 100.0 | 80.6 | 91.7 | 82.0 | 106.6 | 104.2 | 109.1 | 124.3 | 106.2 | 109.2 | 103.3 | 82.9 |

<sup>1</sup>Average irregular amplitude = 5.44

$2r = .550$

Figure 24. Cattle slaughtered: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

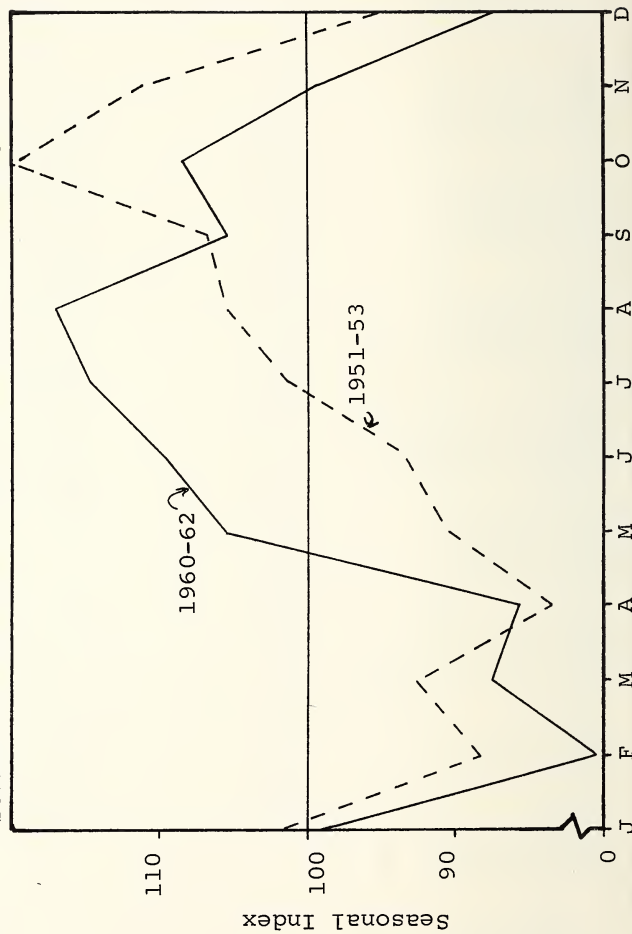


Table 25. Calves slaughtered: Index numbers of seasonal variation, 1951-1962, and 1963 projected

|                      | Jan. | Feb. | Mar. | Apr. | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec. |
|----------------------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|------|
| 1951-62 <sup>1</sup> | 93.8 | 77.2 | 82.3 | 81.9 | 94.9  | 101.8 | 108.9 | 117.3 | 117.3 | 121.7 | 108.9 | 94.0 |
| 1951-53              | 92.1 | 72.6 | 75.8 | 75.0 | 87.5  | 98.0  | 110.7 | 121.5 | 121.5 | 131.2 | 116.3 | 97.7 |
| 1960-62 <sup>2</sup> | 92.8 | 85.5 | 90.7 | 86.0 | 98.4  | 104.5 | 103.2 | 115.7 | 114.3 | 112.6 | 104.8 | 91.7 |
| 1963                 | 90.9 | 88.7 | 93.5 | 86.9 | 101.9 | 102.6 | 100.3 | 115.4 | 113.5 | 111.7 | 103.1 | 91.5 |

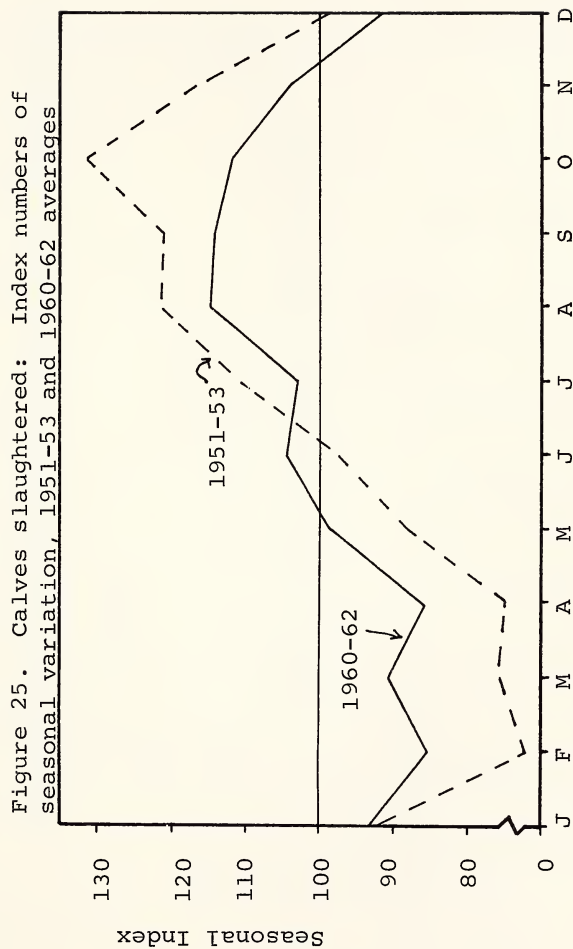
Average irregular amplitude = 4.07  $2r = .924$ 

Table 26. Hogs slaughtered: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr. | May  | June | July | Aug. | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|-------|-------|-------|------|------|------|------|------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 132.6 | 104.8 | 103.3 | 90.9 | 82.4 | 72.7 | 69.7 | 79.2 | 90.1  | 111.9 | 122.5 | 139.7 |
| 1951-53              | 146.0 | 109.7 | 103.4 | 91.7 | 70.1 | 61.1 | 59.5 | 75.0 | 88.4  | 118.2 | 126.5 | 150.5 |
| 1960-62 <sup>2</sup> | 124.5 | 100.7 | 105.0 | 89.1 | 92.0 | 85.3 | 78.2 | 86.2 | 89.9  | 106.6 | 117.7 | 124.8 |
| 1963                 | 124.3 | 99.1  | 102.3 | 86.2 | 95.0 | 88.4 | 77.8 | 88.8 | 86.9  | 109.0 | 119.5 | 122.8 |

Average irregular amplitude = 5.73

 $2r = .964$ 

Figure 26. Hogs slaughtered: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

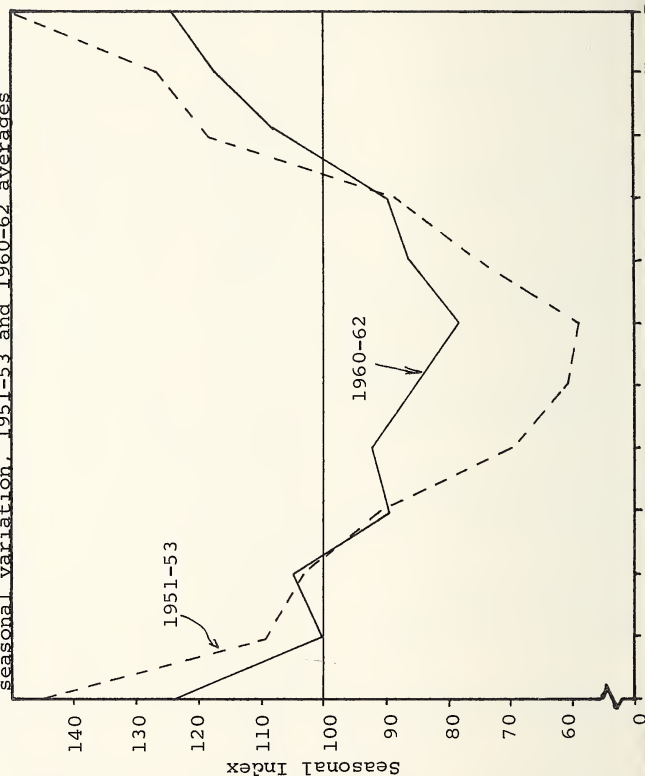




Table 27. Egg production: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb.  | Mar.  | Apr.  | May   | June  | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|----------------------|------|-------|-------|-------|-------|-------|------|------|-------|------|------|------|
| 1951-62 <sup>1</sup> | 89.9 | 98.6  | 127.1 | 126.5 | 122.1 | 104.4 | 96.9 | 91.2 | 87.0  | 89.4 | 82.3 | 84.5 |
| 1951-53              | 85.4 | 103.0 | 138.6 | 137.1 | 131.3 | 108.8 | 95.2 | 87.6 | 82.6  | 83.5 | 73.0 | 73.9 |
| 1960-622             | 91.6 | 94.5  | 117.2 | 118.0 | 116.5 | 102.5 | 97.3 | 93.0 | 91.4  | 95.7 | 90.5 | 91.6 |
| 1963                 | 88.2 | 93.2  | 117.5 | 117.4 | 116.3 | 102.7 | 98.1 | 92.9 | 91.4  | 96.4 | 92.4 | 93.5 |

<sup>1</sup>Average irregular amplitude = 1.73                      2r = .965

Figure 27. Egg production: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

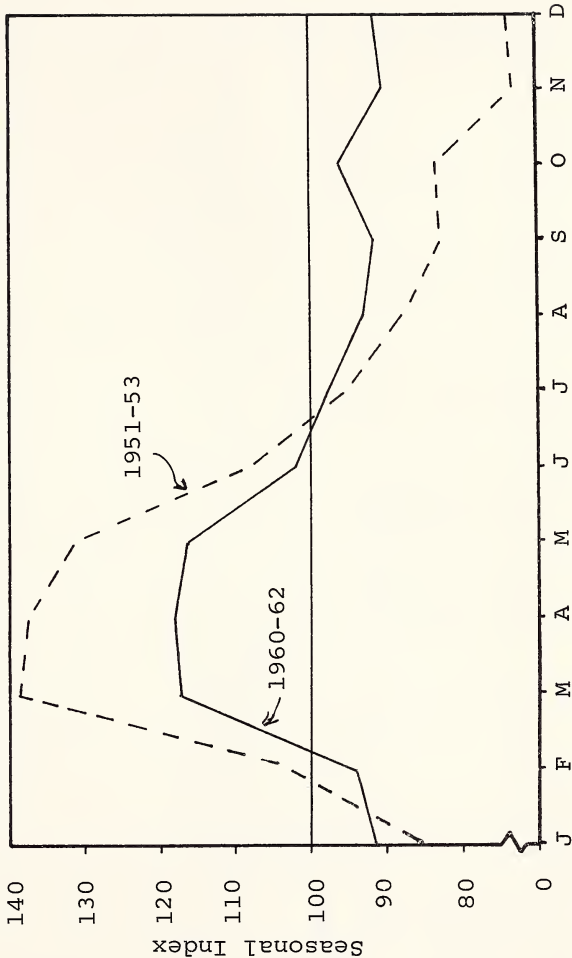


Table 28. Eggs per 100 layers: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug. | Sept. | Oct. | Nov. | Dec. |
|----------------------|------|-------|-------|-------|-------|-------|-------|------|-------|------|------|------|
| 1951-62 <sup>1</sup> | 86.5 | 96.4  | 124.6 | 125.2 | 124.1 | 108.7 | 102.0 | 95.6 | 88.2  | 87.8 | 79.8 | 80.9 |
| 1951-53              | 81.2 | 100.9 | 136.1 | 136.3 | 132.1 | 112.2 | 101.2 | 93.0 | 84.6  | 82.0 | 70.3 | 70.2 |
| 1960-62 <sup>2</sup> | 89.5 | 93.0  | 115.3 | 115.6 | 118.1 | 106.5 | 102.9 | 98.1 | 91.7  | 93.2 | 87.7 | 88.4 |
| 1963                 | 87.5 | 92.4  | 116.5 | 114.8 | 117.6 | 106.7 | 103.2 | 98.0 | 91.5  | 93.8 | 88.8 | 89.3 |

<sup>1</sup>Average irregular amplitude = 1.35

$2r = .968$

Figure 28. Eggs per 100 layers: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

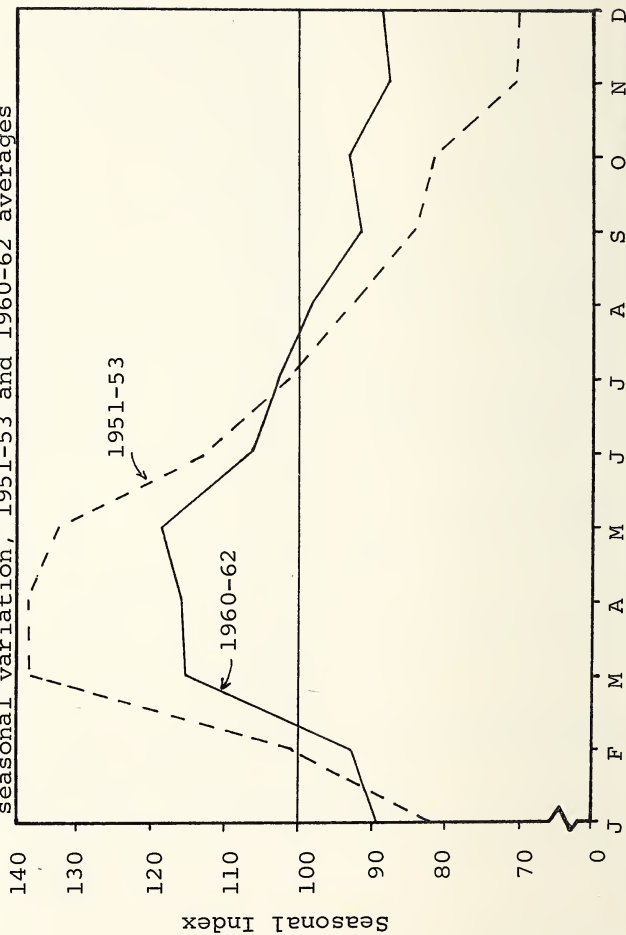


Table 29. Number of layers: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|          | Jan.  | Feb.  | Mar.  | Apr.  | May  | June | July | Aug. | Sept. | Oct.  | Nov.  | Dec.  |
|----------|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|-------|
| 1951-621 | 103.7 | 102.2 | 101.9 | 100.5 | 98.2 | 95.9 | 94.8 | 95.6 | 98.6  | 101.2 | 102.8 | 104.4 |
| 1951-53  | 104.7 | 102.4 | 101.5 | 99.7  | 98.9 | 97.1 | 94.7 | 94.4 | 97.2  | 101.2 | 103.5 | 104.7 |
| 1960-622 | 102.2 | 101.2 | 102.1 | 101.6 | 98.8 | 96.1 | 94.4 | 95.4 | 99.6  | 102.0 | 102.8 | 103.9 |
| 1963     | 101.1 | 100.2 | 101.5 | 101.6 | 98.9 | 96.3 | 94.8 | 95.5 | 99.6  | 102.2 | 103.5 | 104.8 |

1 Average irregular amplitude = 0.71

2r = .924

Figure 29. Number of layers: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

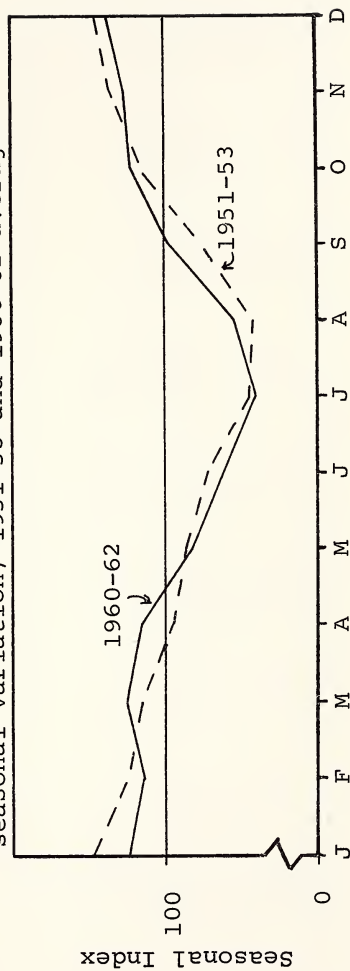


Table 30. Cattle-corn ratios: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June | July | Aug. | Sept. | Oct.  | Nov. | Dec. |
|----------------------|-------|-------|-------|-------|-------|------|------|------|-------|-------|------|------|
| 1951-62 <sup>1</sup> | 101.7 | 102.5 | 101.6 | 102.5 | 101.1 | 96.8 | 97.1 | 97.9 | 101.7 | 99.9  | 98.6 | 98.5 |
| 1951-53              | 102.8 | 101.5 | 102.5 | 103.6 | 101.8 | 97.9 | 97.5 | 99.5 | 101.6 | 96.5  | 97.5 | 97.3 |
| 1960-62 <sup>2</sup> | 101.2 | 103.4 | 101.8 | 101.3 | 100.7 | 95.9 | 98.4 | 96.9 | 102.1 | 101.0 | 99.0 | 98.3 |
| 1963                 | 102.3 | 104.5 | 102.3 | 100.8 | 100.9 | 94.1 | 99.0 | 96.5 | 102.9 | 101.1 | 98.4 | 97.2 |

<sup>1</sup>Average irregular amplitude = 2.33<sup>2</sup>r = .626

Figure 30. Cattle-corn ratios: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

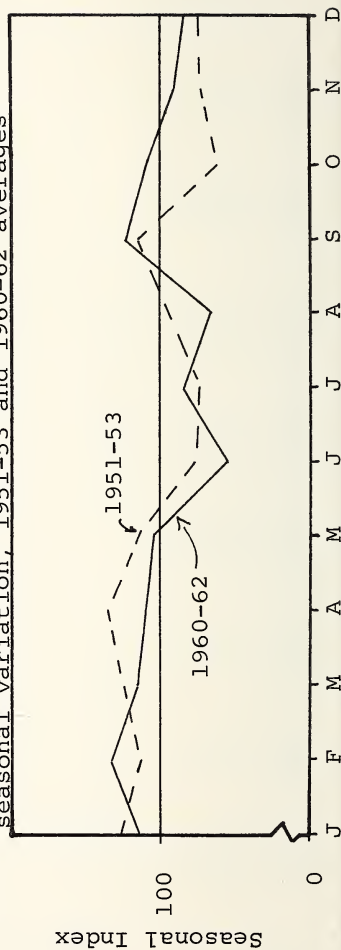




Table 31. Calf-corn ratios: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan.  | Feb.  | Mar.  | Apr.  | May   | June  | July  | Aug.  | Sept. | Oct.  | Nov. | Dec.  |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1951-62 <sup>1</sup> | 101.9 | 101.2 | 100.4 | 102.4 | 102.1 | 98.9  | 98.7  | 98.6  | 100.7 | 99.3  | 97.1 | 98.6  |
| 1951-53              | 102.6 | 101.3 | 101.4 | 102.5 | 103.0 | 101.1 | 100.4 | 103.0 | 100.0 | 94.8  | 94.0 | 95.8  |
| 1960-62 <sup>2</sup> | 102.3 | 102.2 | 100.0 | 101.7 | 101.9 | 96.0  | 98.7  | 95.9  | 100.6 | 100.6 | 99.5 | 100.8 |
| 1963                 | 104.3 | 102.8 | 101.1 | 101.6 | 101.1 | 93.9  | 97.7  | 95.2  | 101.1 | 101.3 | 99.3 | 100.7 |

<sup>1</sup>Average irregular amplitude = 2.07  $2r = -.018$

Figure 31. Calf-corn ratios: Index numbers of seasonal variation, 1951-53 and 1960-62 averages

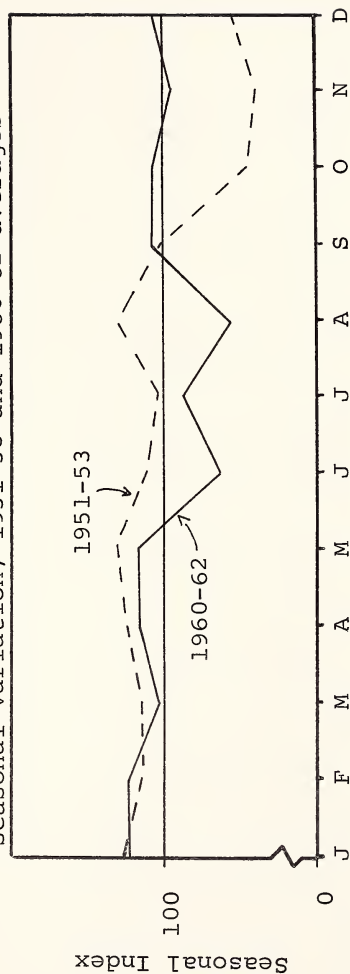


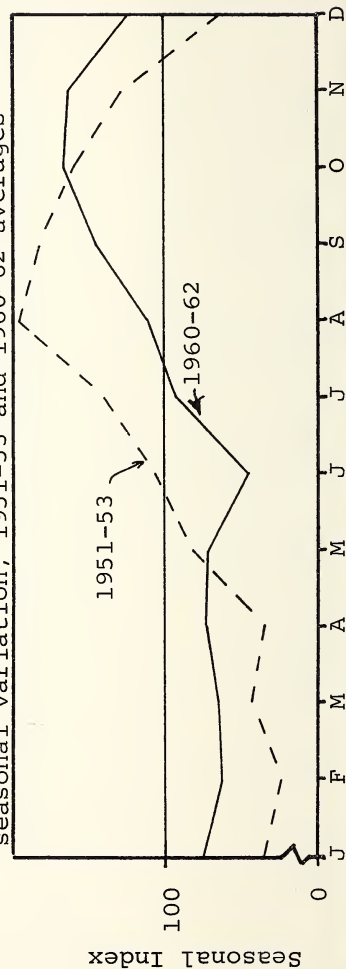
Table 32. Hog-corn ratios: Index numbers of seasonal variation, 1951-1962 and 1963 projected

|                      | Jan. | Feb. | Mar. | Apr. | May  | June  | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  |
|----------------------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| 1951-62 <sup>1</sup> | 95.9 | 95.4 | 94.3 | 96.4 | 97.2 | 98.9  | 101.0 | 103.9 | 106.4 | 106.4 | 104.6 | 99.7  |
| 1951-53              | 93.6 | 92.6 | 94.2 | 93.7 | 98.1 | 100.7 | 104.0 | 109.4 | 108.2 | 106.0 | 103.0 | 96.4  |
| 1960-62 <sup>2</sup> | 97.5 | 96.4 | 96.8 | 97.3 | 97.2 | 94.8  | 99.1  | 101.2 | 104.8 | 106.5 | 106.2 | 102.3 |
| 1963                 | 99.8 | 97.2 | 97.8 | 96.9 | 96.7 | 93.1  | 99.2  | 100.2 | 105.8 | 107.0 | 104.9 | 101.4 |

Average irregular amplitude = 2.51

 $2r = .649$ 

Figure 32. Hog-corn ratios: Index numbers of seasonal variation, 1951-53 and 1960-62 averages













# Harvesting Sweet Potatoes in Louisiana

Wiley D. Poole



Bulletin No. 568

June 1963

Louisiana State University and  
Agricultural and Mechanical College  
Agricultural Experiment Station  
Charles W. Upp, Director

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# Harvesting Sweet Potatoes in Louisiana

WILEY D. POOLE

*Agricultural Engineering Department*

## Introduction

Mechanical handling and harvesting of sweet potatoes offer the best possible solution for reducing the cost of production of this crop, which is the most important vegetable crop in the South and the second most important vegetable crop in the United States.

Farmers with small acreages of sweet potatoes have not been able to mechanize because of the high cost involved. Therefore, the trend has been to concentrate sweet potato production into larger farm units which can justify mechanization. The best way to reduce the cost of production is to use mechanical equipment wherever possible. Larger acreage per farm unit justifies the use of power equipment such as tractor plows, transplanters, tractor cultivators and mechanical harvesters.

With the exception of mechanical harvesters, much of the machinery developed for other crops could be adapted to sweet potato culture and, since harvesting requires more man-hours of labor than all other operations combined, development design and research have been directed toward a suitable machine for harvesting sweet potatoes.

## Removing the Vines

Before the more efficient mechanical harvesters can be used in the field it is necessary to remove the sweet potato vines at least from the crown of the row. Virtually all of the more extensively grown varieties produce a vigorous vine growth. The removal of the vines before digging presents a problem. Even when a plow or middlebuster is used the vines become so tangled around the plow beam that digging must be stopped until the vines are removed. Figure 1 shows such a condition when a middlebuster is used for digging.

When large moldboard plows are used for digging, rolling colters or a stationary knife attached to the plow beam can be used since the plow will be set to run off to one side of the row. When a middlebuster is used the colter is usually run on the center of the row. This results in many potatoes being cut by the colter, so this practice is not recommended. Where the acreage is small it has been common practice to cut the vines with a hoe and pull them to the middles or to use a hay rake and rake them to one side. These methods are not practical for large acreage so other methods have been devised.

A successful tool or machine for removing the vines must remove them at least from the top of the row without damage to the sweet potato roots. This means that the vines must be cut from the hill

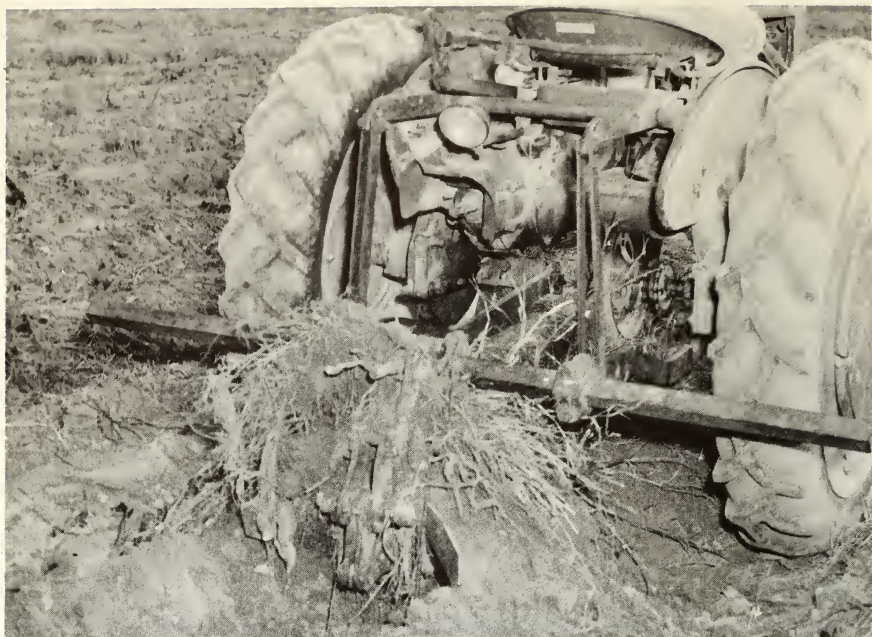


**FIGURE 1.—Middlebuster being used for digging sweet potatoes. Notice how vines collect on plow beam and middlebuster.**



**FIGURE 2.—“Vine Row Harvester” developed by North Carolina State College.**





**FIGURE 3.—Mule drawn drag-type vine cutter.**

with some type of cutting blade. Engineers at North Carolina State College developed a machine that cut the vines on each side of the row, and four special self-cleaning finger type wheels raked the vines to the middle. This machine, shown in Figure 2, was called the "Vine Row Harvester."<sup>1</sup> Several are still being used in Louisiana. Its popularity declined because of the high cost of this implement compared with other less expensive ones found to operate satisfactorily.

One of the most economical and satisfactory implements for removing the vines has been the angle drag with a cutter blade mounted under

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<sup>1</sup>Not in production. For more information contact Agr. Engr. Dept., North Carolina State College, Raleigh, North Carolina.

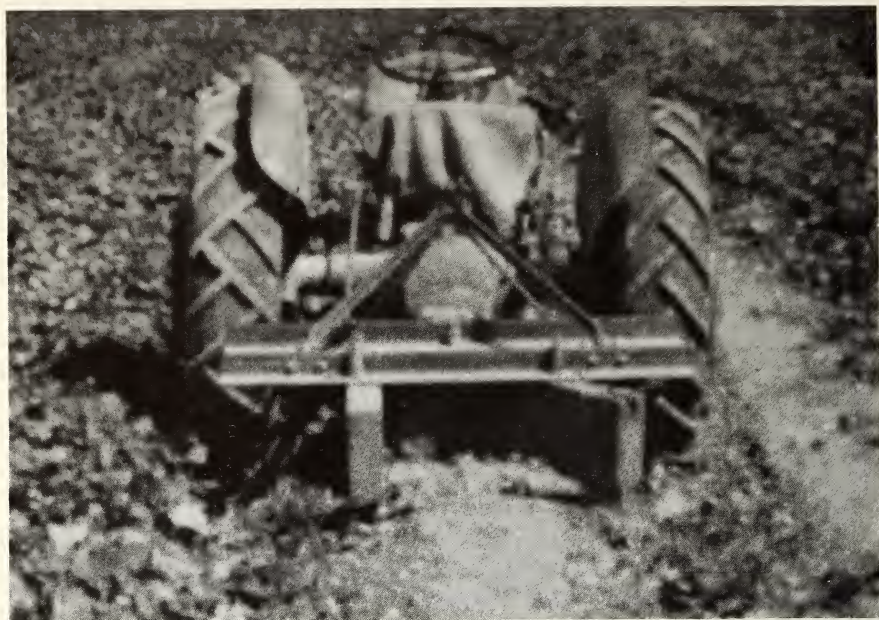


**FIGURE 4.—Tractor mounted type drag for removing sweet potato vines from the row.**

the drag. This tool can be mule drawn as shown in Figure 3, or tractor mounted as shown in Figure 4. When using the mule drawn cutter, the operator rides the drag. By shifting his weight he can control the depth of the cutting blade.

For the tractor mounted drag, the depth of cut is controlled by the hydraulic lift system of the tractor. By mounting disks on the front cultivator shanks of the tractor the vines can be cut from the sides of the row, leaving a clear path for the harvester as shown in Figure 6. It is best to remove the vines from alternate rows and, after harvesting these rows, the remaining rows are de-vined and harvested. This prevents vines from piling up in the middles and interfering with the harvester.

A small rotary pasture clipper mower, as shown in Figures 5 and 6, was also tested and found to do an excellent job of removing the vines from the row.

The use of disk hillers on the front cultivating standards set to bar the row off on each side does a very good job of cutting the vines and leaving a clean row when operated in conjunction with the rotary pasture clipper set to shave off the top one inch of soil. The good results of removing the vines from the row with this implement are shown in Figure 6. This small rotary pasture clipper can be obtained from implement dealers or built in a farm shop.

Another implement that has been used for removing the vines prior to digging the potatoes is the flail type of forage harvester. In this case the flails are made of rubber and are cut to fit the contour of





**FIGURE 5.**—A small rotary type pasture clipper adapted for removing sweet potato vines from the row.



**FIGURE 6.**—Rotary pasture clipper mower used to remove vines in large sweet potato field. Note cleanness of row after use of this machine.



**FIGURE 7.—Flail type forage harvester used for removing sweet potato vines from the row. Flails are cut to fit contour of row.**

the rows as shown in Figure 7. This machine does a good job of removing the vines but is expensive both to own and operate in comparison with other implements.

Several other types of vine harvesters have been built and tested by engineers of the Louisiana Agricultural Experiment Station and discarded as being too expensive or no improvement over what was being used.

When any implement that scrapes or brushes the top of the row is used for removing vines, the potatoes should have ample soil applied to the top of the row during the lay-by cultivation. It is necessary to remove about one inch of soil from the top of the row if the vine cutter is to operate satisfactorily and leave a clean row as is shown in Figure 6. If the sweet potato roots are too close to the top of the soil some cutting of the potatoes will result.

Harvesting of sweet potato vines and dehydrating them for stock feed has been tested by several southern state experiment stations as well as by the USDA. A special machine for harvesting the vines for stock feed was developed and tested by USDA and the Mississippi Experiment Station. A regular forage harvester with special lift fingers attached to the cutter bar was tested in Louisiana. The vines were dehydrated and made into pellets. An analysis of the pellets is shown in Table I.

While the analysis of the feed looks good, it was necessary to run

**TABLE I.—Analysis of Pelletized Sweet Potato Vines Cut for Stock Feed, Showing Difference in Feed Value for Various Parts of the Vine**

| Part of vine                        | Protein | Fat  | NFE  | Fiber | Moist. | Ash  |
|-------------------------------------|---------|------|------|-------|--------|------|
| Leaves only                         | 14.9    | 2.93 | 53.5 | 11.6  | 6.2    | 10.8 |
| Vine only (no leaves)               | 3.8     | 2.6  | 48.1 | 25.5  | 5.7    | 14.0 |
| Vines & leaves 1½" above top of row | 12.5    | 3.1  | 51.8 | 15.2  | 6.1    | 11.1 |
| From 1½" to top of row              | 3.7     | 2.9  | 52.0 | 26.5  | 5.6    | 9.25 |
| All vines 1" above top of row       | 13.3    | 2.9  | 52.5 | 15.8  | 6.1    | 9.1  |
| Vines cut and raked by hand         | 13.3    | 2.0  | 33.4 | 24.5  | 7.3    | 19.6 |
| Vines cut with forage harvester     | 11.0    | 3.7  | —    | 17.7  | —      | —    |

the harvester cutter above the crown of the row to prevent soil from being taken up with the vines. This reduced the tonnage of vines obtained from the field and made it necessary to use a vine removing implement to remove the remaining vine crowns before harvesting.

There are several reasons why the harvesting of the vines for stock feed prior to digging has never become popular with farmers. It requires special machinery and wagons for harvesting and handling. In many cases it would be a long haul to the nearest dehydrator or pellet mill. This operation would have to be carried on at a time when labor would be needed for harvesting and handling the potato crop and it might not be to the best interest of the farmer to remove the vines from the potatoes too far ahead of his regular harvesting operations.

## Harvesting

Of all labor requirements in producing sweet potatoes, harvesting requires more man hours than any other single operation. Surveys reveal that as much as 65 to 70 man-hours may be required to harvest an acre of sweet potatoes. This alone is more than the labor requirements for producing an acre of corn. It is no wonder, therefore, that so much attention has been given to new methods and machinery for harvesting sweet potatoes.

## Plow Type Diggers

On most of the small farms and on many larger farms, digging the potatoes is usually done with a moldboard plow or a middlebuster. When digging with a moldboard plow, two trips are made for each row. On the first trip down the row the plow is set to bar the row off on one side, vines are cut at the same time with a colter or knife attached to the plow beam. On the second trip the plow is set to throw the remaining part of the row over to one side, exposing the potatoes. A mule drawn plow equipped to dig in this manner is shown in Figure 8.

A tractor mounted plow having a portion of the moldboard section cut away and replaced with rotary type spiral slats is shown in Figure





**FIGURE 8.—Moldboard plow with stationary vine cutting knife used for digging sweet potatoes.**



**FIGURE 9.—Rotary moldboard plow attachment for digging sweet potatoes.**





**FIGURE 10.**—Close coupled right and left moldboard plows used for digging sweet potatoes.

9. The idea of the rotary spiral is to sift the soil from the potatoes, leaving the potatoes on top of the ground.

In Experiment Station tests, this digger worked fairly well in very sandy soils but was not satisfactory as a digger for the heavier loam soils of Louisiana. Figure 10 shows potatoes being dug with a right and left moldboard plow coupled close together on the tool bar of a tractor.

This tool was found to be no better than a large middlebuster. Middlebusters having round rods spaced about 2 inches apart in place of the moldboards were tested and found to be unsatisfactory in sandy loam soils. This type implement is shown in Figure 11.

A special middlebuster rod-type digger was developed at the South Carolina Agricultural Experiment Station which appears to be a practical machine for digging sweet potatoes in sandy type soil. This digger has not been tested for the soils and sizes of rows found in Louisiana. The trouble in using plows or middlebuster type diggers is that they fail to get all of the potatoes out of the ground. The cutting and lifting edge of the plow or middlebuster is not as wide as the area covered by the potatoes in the row, so many potatoes are cut and bruised and

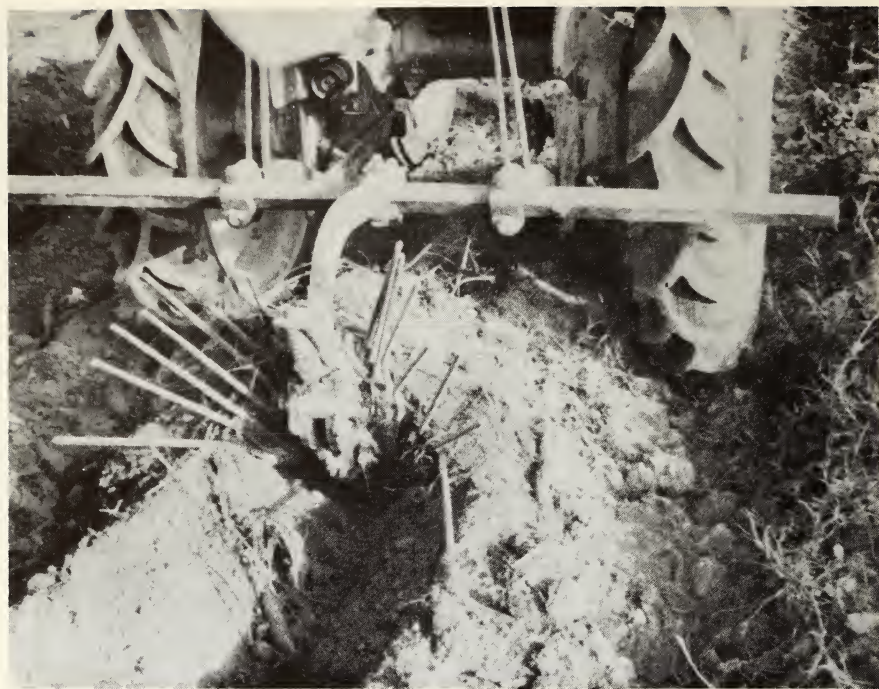


**FIGURE 11.—Middlebuster with rods for moldboards.**

many others are left in the ground. This method of digging increases the time required for gathering the potatoes as compared with other, more mechanical methods.

### **Irish Potato Diggers**

In Louisiana, sweet potatoes are grown on rows varying in width from 42 to 48 inches. This allows plenty of soil for the potatoes to grow in but it also presents a problem when digging. If the soil and the potatoes are to be separated before depositing the potatoes on the ground, some type of power agitation is required. Several different types of regular shaker-chain Irish potato diggers were tested. They were of the sulky type, having their own frame and supporting wheels. One of the early machines tested is shown in Figure 13. All of the Irish potato diggers tested were fundamentally the same type, having a flat type lifting shovel and a shaker chain of various lengths. The lifting shovel did a satisfactory job of lifting all of the potatoes from the row but this shovel had to be 26 inches wide because of the large rows used in Louisiana.

A low flat-bed type Irish potato digger is shown digging sweet potatoes in Figure 14. In the tests, the shaker chain on the regular Irish potato digger separated the soil from the potatoes and deposited them on top





**FIGURE 12.**—A typical field scene where hand labor is used to find, grade and crate sweet potatoes after use of a middlebuster for digging.

of the ground, but bruising was too great in sandy or dry soil. The sulky-type drawn machines were also difficult to maneuver in small fields having narrow turn rows.

### Short-Bed Tractor Mounted Diggers

From experiments with Irish potato diggers it was determined that a machine having a shorter length of shaker chain would reduce bruising. If such a machine were tractor mounted the hydraulic lift system could be used for controlling the depth of the lifting shovel. In this manner a fine degree of control as to depth of digging and amount of soil passing over the shaker chain could be maintained. Additional soil on the chain would also help to reduce bruising. This led to the development of several types of tractor mounted short-bed diggers. One such machine, supported under the tractor, is shown in Figure 15.

Another machine, supported on the three point hydraulic lift system of a one-row tractor, is shown in Figure 16. This machine has a short length of shaker chain and is very maneuverable. The depth of digging is easily controlled by the hydraulic lift system so that with careful control of the depth of the digger shovel, soil can be kept on the shaker chain at all times as a cushion for the potatoes. Bruising is thereby reduced appreciably as compared with the regular Irish potato digger. The amount of agitation given the soil shaker chain depends upon the type of soil and the moisture it contains. If the vines are removed from the row before digging and the tractor operator is careful to keep soil on the shaker chain at all times, bruising can be kept as



**FIGURE 13.—An early model Irish potato digger being used for digging sweet potatoes.**



**FIGURE 14.—A short level-bed Irish potato digger being used for digging sweet potatoes. Note the two sections of mower blade on each side of the shovel for cutting vines that cling to the side of the digger.**





**FIGURE 15.—Tractor mounted sweet potato digger suspended under the tractor. Note the disk hillers mounted on the cultivator standards which cut the vines on each side of the row.**

low or lower than when a moldboard plow or a middlebuster is used to dig. As the potatoes pass off the shaker chain of the digger, they are deposited on the ground on a soft soil bed. Potatoes dug in this manner are more easily field graded and gathered than when dug with a moldboard plow or a middlebuster.

Figure 17 shows a comparison of the conditions for field grading and gathering after using a tractor mounted short bed mechanical digger and a tractor mounted middlebuster to dig the sweet potatoes. These pictures were taken in the same field. Data taken on many similar tests showed that under normal field conditions it required 30 to 40 per cent more time to field grade and gather sweet potatoes when a moldboard plow or a middlebuster was used to dig than when the mechanical digger shown in Figure 16 was used. Field tests also showed that from 20 to 25 per cent more marketable potatoes resulted when the mechanical digger was used in place of the moldboard plow or middlebuster.

### **Sweet Potato Harvesters**

In order to further reduce the labor required for gathering and crating the potatoes after digging, several types of Irish potato harvesting machines were tested for harvesting sweet potatoes. These machines had facilities on the harvester for sacking or crating the potatoes once they were dug. One such harvester is shown in Figure 18. Since Irish



**FIGURE 16.—Sweet potato digger developed at Louisiana State University.**



**FIGURE 17.—Comparison of the condition of the soil and visibility of potatoes when dug by middlebuster (left) and by a tractor mounted short bed shaker chain type digger (right).**





**FIGURE 18.—A large Irish potato harvester having a sacking attachment being used for harvesting sweet potatoes.**

potatoes are usually sacked rather than crated, the machines that were furnished for testing were of the sacker type and were modified to use crates. This type of harvester caused excessive bruising to the sweet potatoes as the selection or grading was done on the rough shaker chain. The transfer chain which carried the sweet potatoes to the sacker was not designed to keep bruising to a minimum. Space on these harvesters for crates was inadequate. They were of the tractor-drawn sulky type and had rather long frames, making turning on the headlands difficult.

Because more emphasis is placed on better quality sweet potatoes each year, more care must be used in digging and handling of fresh market potatoes. Bruised and discolored sweet potatoes are no longer in demand on the fresh market. With the introduction of the sweet potato canning plants in Louisiana, however, an outlet for the bruised and off-size potatoes was established. Bruising and minor abrasions are of no consequence to potatoes that are to be canned since they will be processed as they reach the canning plant. However, if a farmer grades his sweet potatoes and sells his top quality potatoes for the fresh market and his off-grade potatoes to a canning plant, then he must harvest and handle his entire crop with extreme care the same as if all sweet potatoes were going to be sold to the fresh market. This increases the cost of harvesting and handling his potatoes destined for the canning plant.

A harvesting machine that would substantially reduce the labor for gathering, grading and crating by combining all of this into one operation was designed, built and tested. This harvester handles sweet pota-



**FIGURE 19.—Pilot model of a self-propelled sweet potato harvesting machine showing the elevating shaker chain and the crate storage platform on the front.**

toes carefully enough to allow the farmer to sell to fresh market packers and reduces labor enough that he can remain competitive by selling canning potatoes.

Figure 19 is a side view of the pilot model of this harvester showing the elevating shaker chain and the platform on the front of the harvester for storing crates. The harvester is 8 feet wide, extending over two rows while digging one. Traction power is furnished to the large front wheels, which support most of the weight. The rear wheels are close coupled, forming a tricycle type machine. The axles are 10 feet apart and each propelling front wheel is equipped with a hydraulic brake to assist in sharp turning. The desired depth of the digging shovel is easily maintained by fingertip hydraulic controls.

When this harvester is used, the vines are removed from the row before digging. Usually a small rotary type field mower, as shown in Figure 6, is used. The harvester digs one row at a time. A standard type of Irish potato digger shovel is used to lift the sweet potatoes from the row and elevate them up toward the rear of the harvester. The elevator chain is gently agitated while lifting the potatoes so that much of the soil is sifted through and falls back on the row. The potatoes are then gently dumped on a short cross elevator which conveys them to the rubber grading belt. This belt runs from the rear toward the front of the harvester and is divided into a wide center section and two outside small sections. The potatoes from the rear cross elevator are dumped on the center section of the grading belt. As this belt moves forward, the graders, usually six in number, select the potatoes and place them in the side sections as shown in Figure 20.

The side sections feed the potatoes into crates placed at the head





**FIGURE 20.—Grading table on the harvester.**

of each side belt. The potatoes can, in this manner, be divided into two grades as is common when field grading is done by hand. The soil and unwanted roots on the center section of the belt are dropped back on to the row that has been dug. The crate rack on the front of the harvester, as shown in Figure 21, can store about 35 crates. These crates are transferred to a truck on the head land of the field when the harvester completes digging one or several rows.

The forward speeds of this harvester can be varied from  $\frac{1}{2}$  to 9 miles per hour. The forward speed when digging varies, depending upon the yield of potatoes and the degree of grading desired. With the harvester operating in a field yielding 250 to 300 bushels per acre, a crew of seven men, including the tractor driver, can dig, grade and crate sweet potatoes at a rate of 120 bushels per hour. When digging potatoes for canning purposes, it is not necessary to select a grade from the grading belt and the digging can be speeded up.

**Bulk Type Harvesting Machine.**—Canning plants are now equipped to handle sweet potatoes either in bulk or in the large industrial warehouse crates, each holding 27 regular crates (1350 lbs.) of potatoes. Fork lifts are used to handle the large crates at the canning plant.



**FIGURE 21.—Grading belt and crating facilities on the self-propelled harvester.**

This is a substantial saving to both the farmer and the canning plant operator. A farm crate costs approximately 45 cents and records show that the average life of a crate is three trips to the field, whereas the life of these warehouse crates is estimated to be six to eight years, and they cost about \$16.00 each.

Each year an increasing percentage of the sweet potato crop in Louisiana is being canned rather than sold on the fresh market. In Louisiana the percentage of potatoes sold to canning plants has gone up from 7.6 per cent in 1941 to 46 per cent in 1961. Many farmers are now contracting for their entire sweet potato crop to be sold to the canning plants. If the sweet potatoes are to be processed in a reasonably short time at the canning plant then some degree of surface bruising can be tolerated. This tolerance enables a farmer to mechanize the harvesting and handling of his sweet potatoes.

A harvesting machine to harvest potatoes that are to be canned was designed, built and tested by engineers of the Louisiana State University Agricultural Experiment Station. This machine is shown in Figures 22, 23 and 24. The harvester is made up of two units—the digger and elevator section, which is mounted on the regular large tricycle type farm tractor with extended axle on one side, and the cart and grading belt, which is pulled behind the tractor. The digger shovel and elevator, both of which are 26 inches wide, are hydraulically controlled for depth of operation. The wide width of the belt was found necessary due to the tendency of the potatoes to spread in the row during a dry season. The shaker chain elevator has a pitch of  $1\frac{1}{8}$  inch in order to retain potatoes of  $1\frac{1}{4}$  inches in diameter, which is the minimum size saleable to the canning plant. The elevator chain conveyor empties on to





**FIGURE 22.—Shaker chain elevator for bulk harvesting machine.**



**FIGURE 23.—Side view of bulk type sweet potato harvester showing elevator, grading belt and bulk storage cart.**



**FIGURE 24.—Rear view of bulk type harvester, showing grading belt and bulk cart unloading elevator.**

a rubber grading belt attached to and mounted over the bulk storage cart. As the soil and potatoes pass along this belt the desired potatoes are selected and dropped into the cart.

When using this harvester, no attempt is made to grade the sweet potatoes. Since the belt is mounted above the bulk holding cart, the selection of the potatoes requires a minimum of movement and time. All trash, soil, etc., drop back on the row that is being dug. The cart belt is powered from one of the cart's ground wheels so that the desired belt travel is maintained at all times. The cart axle is spread to span two rows. The storage bin will hold approximately 4,000 pounds of potatoes. The cart is very closely coupled to the tractor, which enables easy handling in the field.

The harvester usually travels about one mile per hour and uses six pickers and one driver. In potatoes yielding 300 to 350 bushels per acre this crew can harvest approximately 6,000 pounds per hour.

To empty the cart, the side elevator clutch is engaged and power is supplied by the tractor power take-off. The cart elevator can empty the potatoes from the cart bin into a bulk handling truck or into the large bulk type crates for transporting the potatoes to the canning plant.

**Industrial Harvester.**—The Horticulture Department of Louisiana State University Agricultural Experiment Station and the USDA devel-





**FIGURE 25.—Front view of industrial sweet potato harvester.**

oped a white sweet potato which is high in starch content. A process for extracting the starch was also developed. However, because of the high field labor costs of growing, harvesting and handling this potato, the use of sweet potato starch did not become popular. Machinery and methods used for harvesting the potatoes for these studies were reported by Randolph and Anderson.<sup>2</sup> Later, the Horticulture Department of LSU<sup>3</sup> developed and tested the use of a crude starch made from this potato to be used in the processing of aluminum. In this case the starch did not have to be refined and was very economically made by washing, shredding and dehydrating the potatoes.

To reduce field labor to a minimum, a bulk type harvesting machine, requiring only one man to operate, was developed, built and tested by engineers of the Louisiana State Agricultural Experiment Station. It is shown in Figures 25 and 26. The harvester is tractor mounted and, in place of a long shaker chain as is normally used for the separation of soil and potatoes, a short rotary tumbler is used. This tumbler is very successful in separating the soil from the potatoes in only a 5-foot length, thus allowing a short frame to be used for the harvester. Because the harvester is short, it can be completely tractor mounted, which makes it very maneuverable in the field.

<sup>2</sup>Randolph, John W. and Anderson, W. S. Sweet Potato Production: Mechanical Equipment Studies, Mississippi State College, Agricultural Experiment Station Bulletin 392, September 1943.

<sup>3</sup>For further details write to the Horticulture Department, Louisiana State University, Baton Rouge, Louisiana.



**FIGURE 26.—Rear view of industrial sweet potato harvester.**

After leaving the tumbler, the potatoes are elevated and deposited in a wagon or truck which travels along beside the harvester, as is shown in Figures 25 and 26. This harvester travels at a rate of about 1 mile per hour, harvesting around 7,000 pounds of potatoes per hour, using only the tractor driver. The harvester bruises the potatoes badly but this is not objectionable since they are processed right after harvesting. This harvester can also be used for harvesting sweet potatoes that are to be grown and used solely for stock feed. However, with the introduction of canning plants the off-shaped potatoes that were being sold to the dehydrating plants are now sent to the canning plants. As a result of this, most of the dehydrators are no longer in operation.



# Response of Rice to Fertilizer Phosphorus & Potassium

*as Related to*

## Levels of Available $P$ and $K$ In Soils of Southwest Louisiana

F. J. PETERSON

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## SUMMARY

Several soil analysis-rice response relationships were studied. The final objective was to establish the relationships graphically that will make possible the most accurate prediction from soil analysis of whether rice will respond efficiently to the application of fertilizer phosphorus and potassium.

It is believed that extracting soil phosphorus with  $0.1\text{ N HCl} + 0.03\text{ N NH}_4\text{F}$  at a soil to extracting solution ratio of 1:40 is a method of extracting an amount of phosphorus from the soil that closely approaches the quantity utilized by a rice crop. However, the 1:20 soil to extracting solution ratio is more convenient and has been adopted by the LSU Soil Testing Laboratory.

A significant linear relationship was established between exchangeable and available potassium. There is no reasonable argument that either exchangeable or available potassium is the superior index of the amount of soil potassium utilized by rice. Since available potassium is easier to determine in the laboratory, it is without a doubt the most practical index. If a soil from southwest Louisiana contains less than approximately 70 ppm of available potassium a favorable increase in rice yield can be expected from the application of fertilizer potassium 84 percent of the time.



# Response of Rice To Fertilizer Phosphorus and Potassium As Related to Levels of Available Phosphorus And Potassium in Soils of Southwest Louisiana

F. J. PETERSON, M. B. STURGIS, AND R. J. MIEARS<sup>1</sup>

The development of soil testing procedures that give a fairly accurate indication of the amounts of fertilizer phosphorus or potassium to which a crop can be expected to respond economically has long been sought by many agricultural workers. Considering the wide degree of biological variation between species and varieties of crops and the physical and chemical variations within soils, the relationships that have thus far been established can be considered as major advances, but there is always the ever present condition that one can never be completely certain that any one soil sample may not represent the exception to a general relationship that has been accepted.

The need for determining relationships between available nutrients in soil planted to rice and economical response to added nutrients is demonstrated by the fact that presently the nutrient elements removed in crops are barely being replaced by fertilizers (10). If the rice growers of Louisiana increase the yield of rice to a level of 45 hundredweight, or 28 barrels per acre, which experimental results are showing to be attainable, much larger amounts of N, P, and K must be applied as fertilizers. To produce 4,500 pounds, or 28 barrels, of rough rice per acre, the whole crop must absorb or take up 110 pounds of N, 20 pounds of P, and 88 pounds of K. The rough rice from this crop would contain 60 pounds of N, 15 pounds of P, and 16 pounds of K. The soil test results associated with this work and many more that have been made by the Louisiana State University Soil Testing Laboratory indicate that in many cases the available P and K in these soils are much too low to support the expected yields. This is particularly obvious when it is noted that the tests for available P are commonly below 20 ppm and those for available K are usually below 90 ppm. It is to be further noted that one crop will not likely absorb more than 20 to 30 percent of the available P or more than 50 percent of the available K shown by the soil test.

Soil analysis has met with reasonable success as a guide for making fertilizer recommendations for crops grown under well-drained condi-

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TABLE 1.—Identification of the experimental locations.

| Exp. Loc. | Date | Soil Type                    | Farm                           | Nearest Town | Parish          | Date Sampled  |
|-----------|------|------------------------------|--------------------------------|--------------|-----------------|---------------|
| 1         | 1955 | Crowley Midland s.l.         | Rice Expt. Station             | Crowley      | Acadia          | April 1, '55  |
| 2         | 1955 | Edna v.f.s.a.l.              | Stine & Kinney Farm            | Edgerly      | Calcasieu       | June 3, '55   |
| 3         | 1955 | Calcasieu v.f.s.a.l.         | Paul Lower                     | Oberlin      | Allen           | April 18, '55 |
| 4         | 1955 | Oberlin s.l.                 | Wilfred LaHave & Clifton Fruge | Ville Platte | Evangeline      | April 1, '55  |
| 5         | 1955 | Calcasieu v.f.s.a.l.         | F. E. Landry                   | Elton        | Jefferson Davis | April 1, '55  |
| 6         | 1956 | Edna v.f.s.a.l.              | J. L. & Wallace Watkins        | Welsh        | Jefferson Davis | June 5, '56   |
| 7         | 1956 | Crowley s.l.                 | Rice Expt. Station             | Crowley      | Acadia          | Oct. 29, '57  |
| 8         | 1956 | Olivier s.l. (prairie phase) | Edier Bares                    | Erath        | Vermilion       | Sept. 12, '57 |
| 9         | 1956 | Caddo s.l.                   | Miller Brothers                | Reeves       | Allen           | March 27, '57 |
| 10        | 1956 | Oberlin s.l.                 | Johnny Chapman                 | Ville Platte | Evangeline      | March 27, '57 |
| 11        | 1957 | Caddo s.l.                   | H. D. Dear, Jr.                | Oberlin      | Allen           | March 27, '57 |
| 12        | 1957 | Oberlin s.l.                 | Otis Fontenot                  | Ville Platte | Evangeline      | March 27, '57 |
| 13        | 1957 | Crowley s.l.                 | Norman Langfeld                | Indian Bayou | Vermilion       | March 27, '57 |
| 14        | 1957 | Beaumont c.l.                | J. L. & Wallace Watkins        | Welsh        | Jefferson Davis | March 1, '57  |
| 15        | 1957 | Crowley Midland s.l.         | Rice Expt. Station             | Crowley      | Acadia          | April 1, '55  |
| 16        | 1958 | Crowley s.l.                 | King Farm                      | Fenton       | Jefferson Davis | Jan. 19, '59  |
| 17        | 1958 | Crowley s.l.                 | Rice Expt. Station             | Crowley      | Acadia          | Jan. 20, '59  |
| 18        | 1958 | Beaumont clay*               | J. L. & Wallace Watkins        | Welsh        | Jefferson Davis | Jan. 20, '59  |
| 19        | 1958 | Beaumont clay**              | J. L. & Wallace Watkins        | Welsh        | Jefferson Davis | Jan. 20, '59  |

\* East site

\*\* West site

tions. However, according to Reed and Sturgis (9), flooding soils that are planted to rice causes certain variation in the physical, chemical and biological characteristics of the soils which limits the use of results from presently established soil-analysis techniques for predicting yield responses of rice to added fertilizer phosphorus and potassium.

A four-year study of the relationships involved between soil phosphorus and potassium and responses to fertilizer phosphorus and potassium has been conducted with rice on some of the representative soils in the rice growing area of southwest Louisiana. The objectives of this study were (a) to establish the relationship between exchangeable or available potassium in the soil and the response of rice to added potash, and (b) to investigate the relationship between available phosphorus extracted at four different soil to extracting solution ratios and the response of rice to fertilizer phosphate.

## EXPERIMENTAL

### Field Materials

These investigations have been made in cooperation with the rice fertility experiments conducted in 1955, 1956, 1957, and 1958 at the Rice Experiment Station and at locations scattered through the rice area of southwest Louisiana (Table 1). Descriptions of the experimental designs and rice yields at each location have been reported by Miears in the Annual Progress Reports of the Rice Experiment Station (4, 5, 6, 7). Selected field data from the experimental locations are presented in Tables 3 and 4.

A composite sample of soil from the A horizon was taken at each experimental location. Samples were taken before the treatments were applied or from the non-treated plots.

### Laboratory Methods

Normal ammonium acetate was used to extract the exchangeable potassium. This method is recorded by Driskell (2). Available potassium was extracted with 0.10 N HCl at a soil to extracting solution ratio of 1:20, shaken for 20 minutes. Both exchangeable and available potassium were determined in the extracts by use of a Beckman Model DU spectrophotometer equipped with an oxygen-acetylene flame attachment. Available phosphorus was determined by a modification of the method of Bray and Kurtz (1). The soil was extracted with 0.10 N HCl + 0.03 N  $\text{NH}_4\text{F}$  in 4 soil to extracting solution ratios: 1:10, 1:20, 1:40, and 1:60. The volume of extracting solution was kept at 100 ml., and the soil sample weight varied. The phosphomolybdenum blue color was developed in aliquots of the extracts for comparisons by the method of Lowery *et al.* (3) as modified by Upchurch (11). The optical densities of the color in the extracts were determined with a Beckman Model DU spectrophotometer.

## RESULTS AND DISCUSSION

The amounts of exchangeable and available potassium found in these soils are recorded in Table 2. The relationship between exchangeable and available potassium is illustrated graphically in Figure 1. According to the regression equation presented in Figure 1, it can be expected that available potassium will be equal to 87 percent of the exchangeable plus 16 if the units are ppm. In accord with the calculated standard error of estimate, this prediction will be accurate within plus or minus 11 ppm two-thirds of the time.

The fact that exchangeable and available potassium are so closely and directly related makes it seem hardly worthwhile to question which is a better index of the amount of soil potassium available to rice. The ease with which available potassium by the dilute hydrochloric acid method can be determined in the laboratory makes it a more convenient index in comparison with exchangeable potassium.

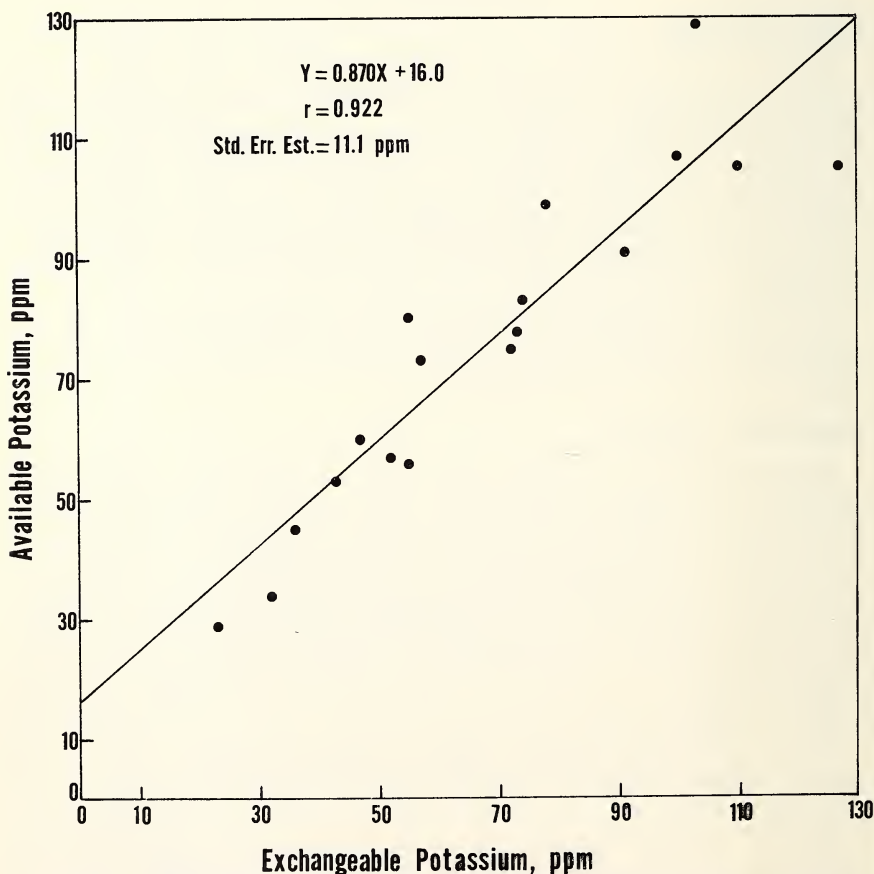


FIGURE 1.—The relationship between exchangeable and available soil potassium.



TABLE 2.—Available phosphorus, available potassium, exchangeable potassium, and total nitrogen in the soils used for fertilizer experiments with rice, 1955-1958

| Expt.<br>location | Soil Type                    | Total<br>N<br>% | Available P (ppm) extracted with four<br>soil:extracting solution ratios |      |      |      | Available<br>K<br>(ppm) | Exchange-<br>able K<br>(ppm) |
|-------------------|------------------------------|-----------------|--------------------------------------------------------------------------|------|------|------|-------------------------|------------------------------|
|                   |                              |                 |                                                                          |      |      |      |                         |                              |
|                   |                              |                 | 1:10                                                                     | 1:20 | 1:40 | 1:60 |                         |                              |
| 1                 | Crowley Midland s.l.         | 0.11            | 19.2                                                                     | 23.0 | 26.4 | 30.8 | 83                      | 74                           |
| 2                 | Edna v.f.s.l.                | 0.07            | 14.1                                                                     | 16.5 | 16.7 | 17.3 | 73                      | 57                           |
| 3                 | Calcasieu v.f.s.l.           | 0.08            | 14.0                                                                     | 17.6 | 20.8 | 22.1 | 99                      | 78                           |
| 4                 | Oberlin s.l.                 | 0.10            | 15.5                                                                     | 17.5 | 19.3 | 20.1 | 129                     | 103                          |
| 5                 | Calcasieu v.f.s.l.           | 0.06            | 6.5                                                                      | 9.1  | 10.9 | 11.5 | 78                      | 73                           |
| 6                 | Edna v.f.s.l.                | 0.10            | 8.1                                                                      | 13.2 | 17.5 | 20.2 | 80                      | 55                           |
| 7                 | Crowley s.l.                 | 0.06            | 2.0                                                                      | 3.6  | 6.1  | 6.9  | 60                      | 47                           |
| 8                 | Olivier s.l. (prairie phase) | 0.08            | 17.6                                                                     | 25.2 | 32.0 | 35.7 | 53                      | 43                           |
| 9                 | Caddo s.l.                   | 0.07            | 7.1                                                                      | 8.6  | 10.8 | 11.0 | 29                      | 23                           |
| 10                | Oberlin s.l.                 | 0.04            | 1.3                                                                      | 2.5  | 4.6  | 5.7  | 57                      | 52                           |
| 11                | Caddo s.l.                   | 0.06            | 5.1                                                                      | 6.9  | 8.7  | 9.7  | 45                      | 36                           |
| 12                | Oberlin s.l.                 | 0.11            | 8.0                                                                      | 11.8 | 14.9 | 16.3 | 91                      | 91                           |
| 13                | Crowley s.l.                 | 0.08            | 6.2                                                                      | 8.9  | 12.1 | 13.3 | 75                      | 72                           |
| 14                | Beaumont c.l.                | 0.11            | 10.4                                                                     | 17.8 | 24.9 | 25.9 | 107                     | 100                          |
| 15*               | Crowley Midland s.l.         | 0.11            | 19.2                                                                     | 23.0 | 26.4 | 30.8 | 83                      | 74                           |
| 16                | Crowley s.l.                 | 0.06            | 3.1                                                                      | 4.6  | 4.9  | 5.0  | 34                      | 32                           |
| 17                | Crowley s.l.                 | 0.07            | 1.6                                                                      | 2.9  | 4.3  | 5.7  | 56                      | 55                           |
| 18                | Beaumont clay                | 0.10            | 3.4                                                                      | 6.8  | 9.1  | 10.6 | 105                     | 127                          |
| 19                | Beaumont clay                | 0.10            | 3.9                                                                      | 8.6  | 12.7 | 14.0 | 105                     | 110                          |

\* The same experimental site as 1 in 1955.

Data in Table 3 show the increases in yield gained from added fertilizers both with and without potash. The response to added potash presented in the last column of Table 3 as related to exchangeable soil potassium (Table 2) is shown graphically in Figure 2. The relationship between response to fertilizer potash and available soil potassium is shown in Figure 3. By visual comparison there seems to be little difference between the regression line calculated for exchangeable potassium and response to added potash (Figure 2) and the regression line calculated for available potassium and response to added potash (Figure 3). It is certainly true that the regression equations are very similar; however, the comparison should be made from a more substantial and practical viewpoint. If both standard errors of estimate are rounded off to two significant figures, it can be said that predictions made from either of the regression lines will be accurate within plus or minus 1.2 barrels per acre 66 percent of the time. This common value for both regression lines is well established. One of the objectives of this study was to establish a level of exchangeable or available potassium below which an increase from added potash can be expected. The regression

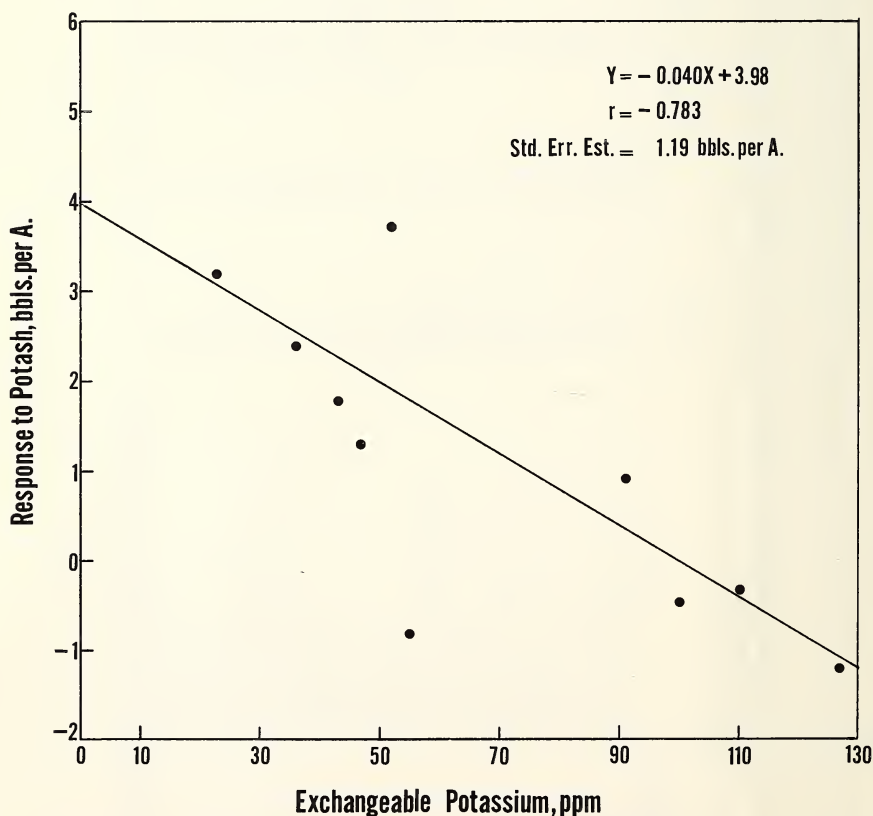


FIGURE 2.—Response of rice to potash as related to exchangeable soil potassium.

TABLE 3.—Yield increases in barrels of rough rice per acre gained from potassium in fertilizers

| Expt.<br>location | Yield with no<br>fertilizer<br>treatment,<br>bbls./acre | Fertilizer<br>treatment<br>without K <sub>2</sub> O |                                                | Yield with<br>fertilizer<br>without K <sub>2</sub> O,<br>bbls./acre | Complete<br>treatment<br>lbs./acre |                                                | Yield with<br>complete<br>treatment,<br>bbls./acre | Response<br>to added<br>K <sub>2</sub> O,<br>bbls./acre |
|-------------------|---------------------------------------------------------|-----------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------|------------------------------------|------------------------------------------------|----------------------------------------------------|---------------------------------------------------------|
|                   |                                                         | N                                                   | P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O |                                                                     | N                                  | P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O |                                                    |                                                         |
| 7                 | 20.5                                                    | 80 - 40 - 0                                         |                                                | 34.0                                                                | 80 - 40 - 20                       |                                                | 35.3                                               | 1.3                                                     |
| 8                 | 17.2                                                    | 80 - 40 - 0                                         |                                                | 26.6                                                                | 80 - 40 - 20                       |                                                | 28.4                                               | 1.8                                                     |
| 9                 | 17.1                                                    | 80 - 40 - 0                                         |                                                | 22.8                                                                | 80 - 40 - 40                       |                                                | 26.0                                               | 3.2                                                     |
| 10                | 19.0                                                    | 80 - 40 - 0                                         |                                                | 28.8                                                                | 80 - 40 - 40                       |                                                | 32.5                                               | 3.7                                                     |
| 11                | 19.9                                                    | 80 - 40 - 0                                         |                                                | 23.3                                                                | 80 - 40 - 40                       |                                                | 25.7                                               | 2.4                                                     |
| 12                | 21.7                                                    | 80 - 40 - 0                                         |                                                | 31.2                                                                | 80 - 40 - 20                       |                                                | 32.1                                               | 0.9                                                     |
| 14                | 20.8                                                    | 80 - 40 - 0                                         |                                                | 27.6                                                                | 80 - 40 - 40                       |                                                | 27.1                                               | -0.5                                                    |
| 17                | 17.0                                                    | 80 - 40 - 0                                         |                                                | 29.3                                                                | 80 - 40 - 20                       |                                                | 28.5                                               | -0.8                                                    |
| 18                | 33.0                                                    | 80 - 40 - 0                                         |                                                | 34.2                                                                | 80 - 40 - 20                       |                                                | 33.0                                               | -1.2                                                    |
| 19                | 26.8                                                    | 80 - 40 - 0                                         |                                                | 31.3                                                                | 80 - 40 - 40                       |                                                | 31.0                                               | -0.3                                                    |

TABLE 4.—Yield increases in barrels of rough rice per acre gained from phosphorus in the fertilizers

| Expt.<br>location | Yield with no<br>fertilizer<br>treatment,<br>bbls./acre | Fertilizer<br>treatment<br>without P <sub>2</sub> O <sub>5</sub> |                                                | Yield with<br>fertilizer<br>without P <sub>2</sub> O <sub>5</sub> ,<br>bbls./acre | Complete<br>treatments,<br>lbs./acre |                                                | Yield with<br>complete<br>treatments,<br>bbls./acre | Response<br>to added<br>P <sub>2</sub> O <sub>5</sub> ,<br>bbls./acre |
|-------------------|---------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------|
|                   |                                                         | N                                                                | P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O |                                                                                   | N                                    | P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O |                                                     |                                                                       |
| 7                 | 20.5                                                    | 80 - 0 - 40                                                      |                                                | 31.5                                                                              | 80 - 40 - 40                         |                                                | 34.7                                                | 3.2                                                                   |
| 8                 | 17.2                                                    | 80 - 0 - 40                                                      |                                                | 25.9                                                                              | 80 - 20 - 40                         |                                                | 26.0                                                | 0.1                                                                   |
| 9                 | 17.1                                                    | 80 - 0 - 40                                                      |                                                | 21.6                                                                              | 80 - 20 - 40                         |                                                | 25.7                                                | 4.1                                                                   |
| 10                | 19.0                                                    | 80 - 0 - 40                                                      |                                                | 27.7                                                                              | 80 - 20 - 40                         |                                                | 32.7                                                | 5.2                                                                   |
| 11                | 19.9                                                    | 80 - 0 - 40                                                      |                                                | 24.8                                                                              | 80 - 20 - 40                         |                                                | 26.0                                                | 1.2                                                                   |
| 12                | 21.7                                                    | 80 - 0 - 40                                                      |                                                | 29.5                                                                              | 80 - 20 - 40                         |                                                | 31.2                                                | 1.7                                                                   |
| 14                | 20.8                                                    | 80 - 0 - 40                                                      |                                                | 26.9                                                                              | 80 - 20 - 40                         |                                                | 27.5                                                | 0.6                                                                   |
| 17                | 17.0                                                    | 80 - 0 - 40                                                      |                                                | 28.6                                                                              | 80 - 20 - 40                         |                                                | 30.4                                                | 1.8                                                                   |
| 18                | 33.0                                                    | 80 - 0 - 40                                                      |                                                | 33.2                                                                              | 80 - 20 - 40                         |                                                | 34.2                                                | 1.0                                                                   |
| 19                | 26.8                                                    | 80 - 0 - 40                                                      |                                                | 30.4                                                                              | 80 - 40 - 40                         |                                                | 31.0                                                | 0.6                                                                   |

lines provide a good means of determining this level but predictions from their use will be accurate only within plus or minus 1.2 barrels per acre. Therefore, the only safe predictions of yield increases will be made for values of response that are equal to or greater than 1.2 barrels per acre. For example, by following the 1.2 barrel per acre value in Figure 2 horizontally across until it intersects with the regression line, it can be expected that a soil having 69 ppm exchangeable potassium will give a yield response to added potash 84 percent of the time. If this same procedure is used with Figure 3, it can be shown that a soil having 71 ppm available potassium could be expected to give a yield response to added potash 84 percent of the time. By this method of interpretation, a soil having 69 ppm of exchangeable potassium or 71 ppm available potassium can be expected to give a yield response to added potash that may vary between 0 and 2.4 barrels per acre. Since the values, 69 and 71 ppm, of exchangeable or available potassium are so close together as to be within laboratory experimental error, either exchangeable or available potassium would serve as a satisfactory index for estimating the amount of soil potassium available to

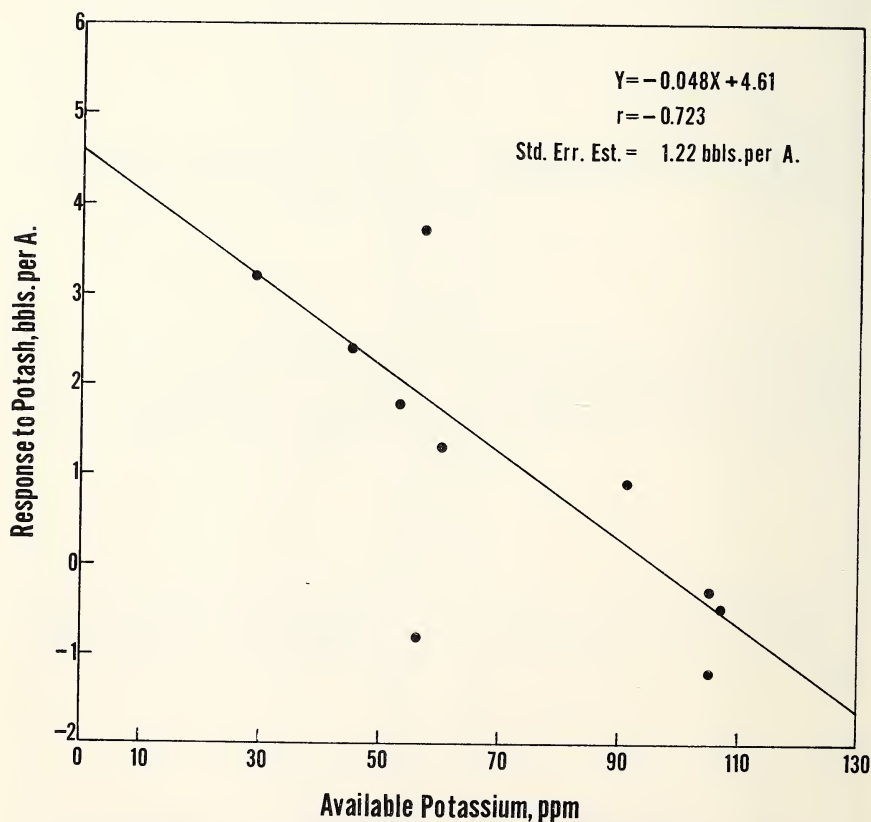


FIGURE 3.—Response of rice to potash as related to available soil potassium.



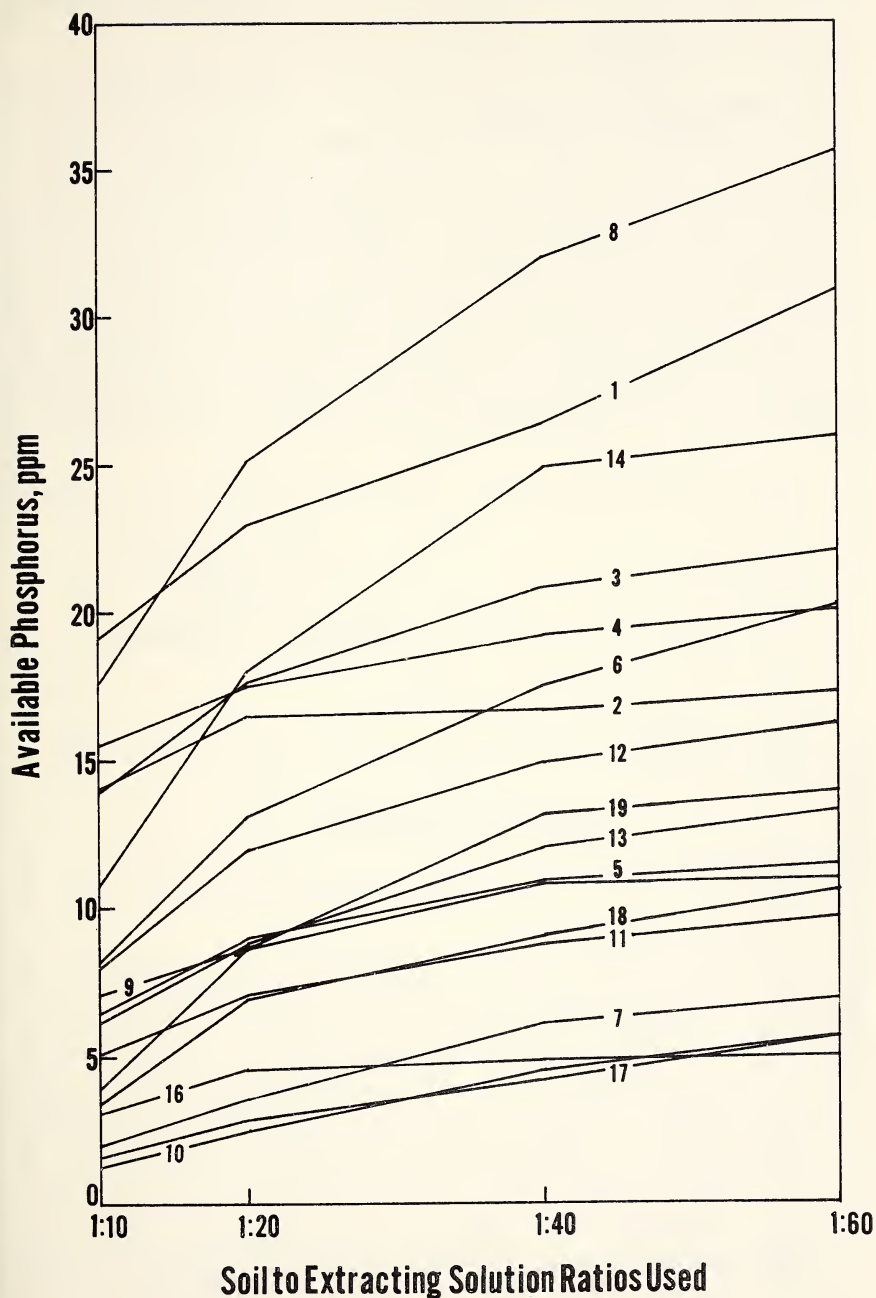


FIGURE 4.—Effect of soil to extracting solution ratios on the amount of phosphorus extracted at each experimental location.

rice. It can be concluded that similar soils having less than approximately 70 ppm exchangeable or available potassium will give a favorable yield response to added potash 84 percent of the time.

It can be seen from the data presented in Table 2 that the amount of soil phosphorus that can be extracted with 0.1 N HCl + 0.03 N  $\text{NH}_4\text{F}$  varies considerably among the soils represented. It can also be seen that the amount increases as the soil to extracting solution ratio is widened. Four times as much phosphorus was extracted with a 1:60 ratio as with a 1:10 ratio from Oberlin silt loam at experimental location 6. This relationship is more clearly illustrated in Figure 4. In order to decide which of these soil to extracting solution ratios more closely dissolves an amount of soil phosphorus that may be closely related to the amount that rice can utilize, it seems desirable to estimate the amount of phosphorus per acre that is utilized by a 45 hundredweight or 28 barrel rice crop. In data presented by the National Research Council (8) it was estimated that

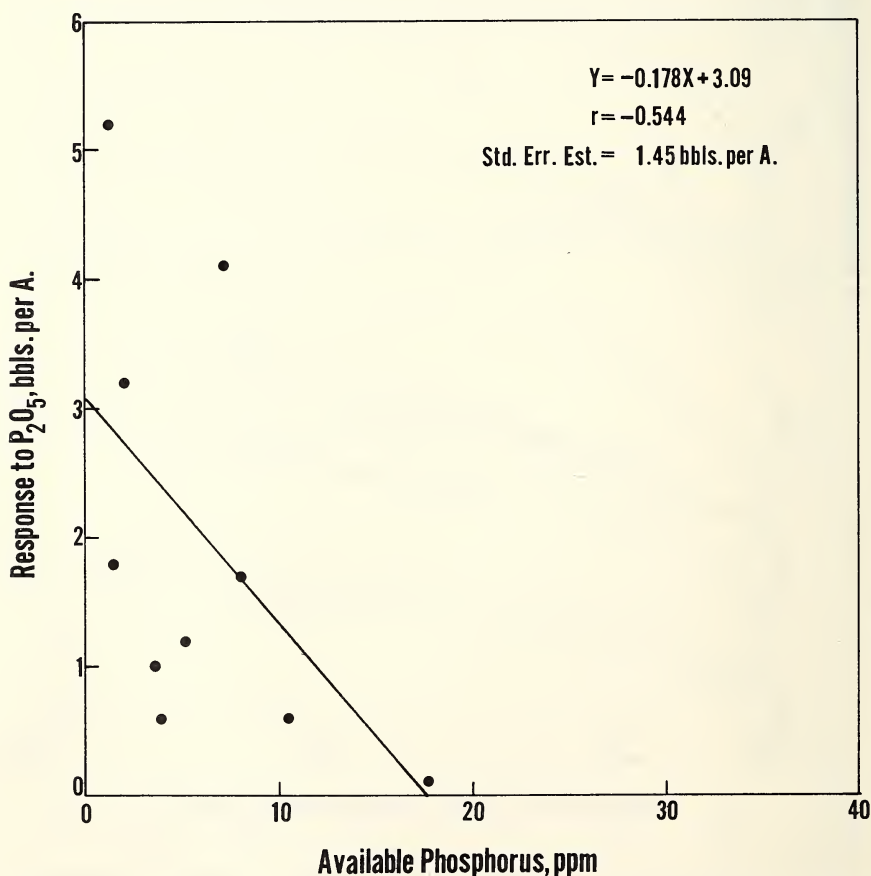


FIGURE 5.—Response of rice to  $\text{P}_2\text{O}_5$  as related to available soil phosphorus extracted at a 1:10 soil to extracting solution ratio.

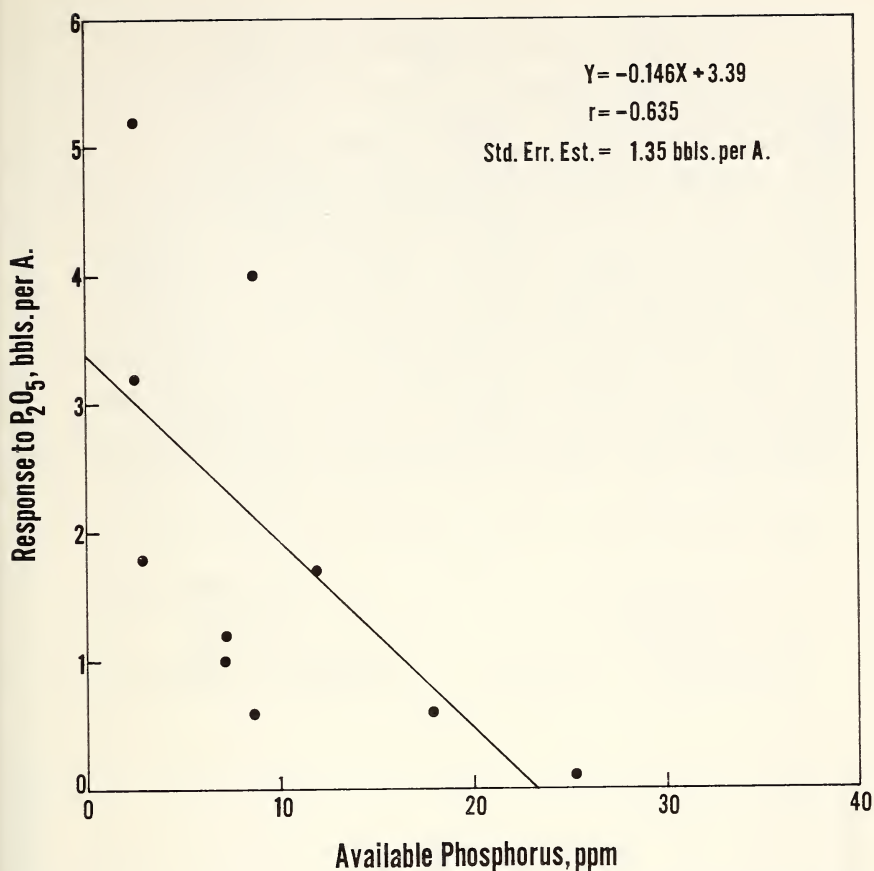


FIGURE 6.—Response of rice to  $P_2O_5$  as related to available soil phosphorus extracted at a 1:20 soil to extracting solution ratio.

the minimum amount of phosphorus utilized by a 45 hundredweight rice crop is 20 pounds per acre. This is in excess of the amount extracted from some of the Crowley, Oberlin, and Caddo soils studied. It would seem desirable to use a soil to extracting solution ratio that will extract at least an amount of phosphorus equal to that absorbed by the crop and still keep the ratio within the limits of practical laboratory methods. By examination of Figure 4, it is obvious that the 1:60 ratio dissolved the greatest amount of soil phosphorus in all cases. On the other hand, such a wide ratio either demands a small quantity of soil or a large volume of extracting solution, neither of which is desirable. This problem of sample size and solution volume could be partially solved by dropping back to the 1:40 ratio. A fact in favor of using a 1:40 ratio is that in most cases there is a noticeable increase in the phosphorus extracted at a 1:40 ratio over that extracted at a 1:20 ratio, but the 1:40 ratio is too wide to be used in routine laboratory methods.

It was then decided to determine which of the soil to solution ratios gave soil phosphorus values that could be most closely correlated with responses to fertilizer phosphorus. Data in Table 4 show the yield increases gained from added fertilizers both with and without fertilizer phosphorus. The response to added fertilizer phosphorus presented in the last column is plotted graphically with available soil phosphorus extracted at 1:10, 1:20, 1:40, and 1:60 soil to extracting solution ratios in Figures 5, 6, 7, and 8, respectively. Comparison of the correlation coefficients and the standard errors of estimate for the relationships presented in these figures show that the values from the 1:10 ratio could not be significantly correlated with responses to fertilizer phosphorus. The values for available soil phosphorus from 1:20, 1:40, and 1:60 ratios could be correlated with responses to fertilizer phosphorus. The correlation coefficients were significant and so nearly alike in value that it could not be said that one represented a better relationship than the other. The 1:20 soil to solution ratio is easiest to work with in

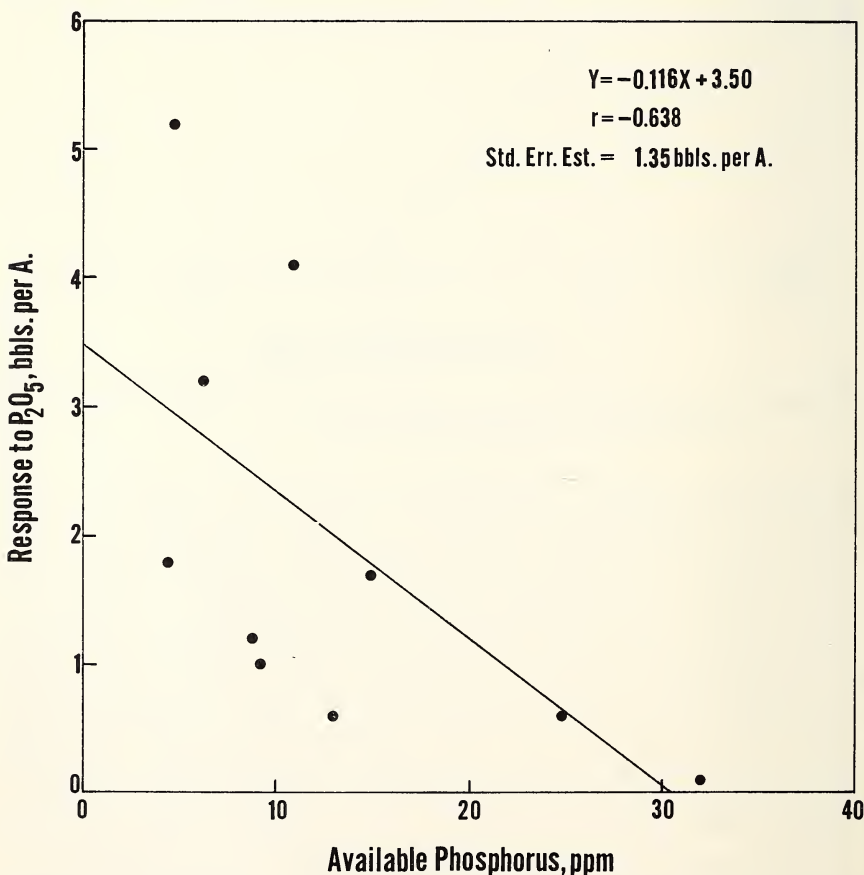


FIGURE 7.—Response of rice to  $P_2O_5$  as related to available soil phosphorus extracted at a 1:40 soil to extracting solution ratio.



TABLE 5.—Available phosphorus and potassium in soil as related to responses of rice to fertilizer phosphorus and potassium

| Expt. location | Soil Type                     | Available P (ppm) | Response to added $P_2O_5$ , bbls./acre | Available K (ppm) | Response to added $K_2O$ , bbls./acre |
|----------------|-------------------------------|-------------------|-----------------------------------------|-------------------|---------------------------------------|
| 7              | Crowley si.l.                 | 3.6               | 3.2                                     | 60                | 1.3                                   |
| 8              | Olivier si.l. (prairie phase) | 25.2              | 0.1                                     | 53                | 1.8                                   |
| 9              | Caddo si.l.                   | 8.6               | 4.1                                     | 29                | 3.2                                   |
| 10             | Oberlin si.l.                 | 2.5               | 5.2                                     | 57                | 3.7                                   |
| 11             | Caddo si.l.                   | 6.9               | 1.2                                     | 45                | 2.4                                   |
| 12             | Oberlin si.l.                 | 11.8              | 1.7                                     | 91                | 0.9                                   |
| 14             | Beaumont c.l.                 | 17.8              | 0.6                                     | 107               | -0.5                                  |
| 17             | Crowley si.l.                 | 2.9               | 1.8                                     | 56                | -0.8                                  |
| 18             | Beaumont clay                 | 6.8               | 1.0                                     | 105               | -1.2                                  |
| 19             | Beaumont clay                 | 8.6               | 0.6                                     | 105               | -0.3                                  |

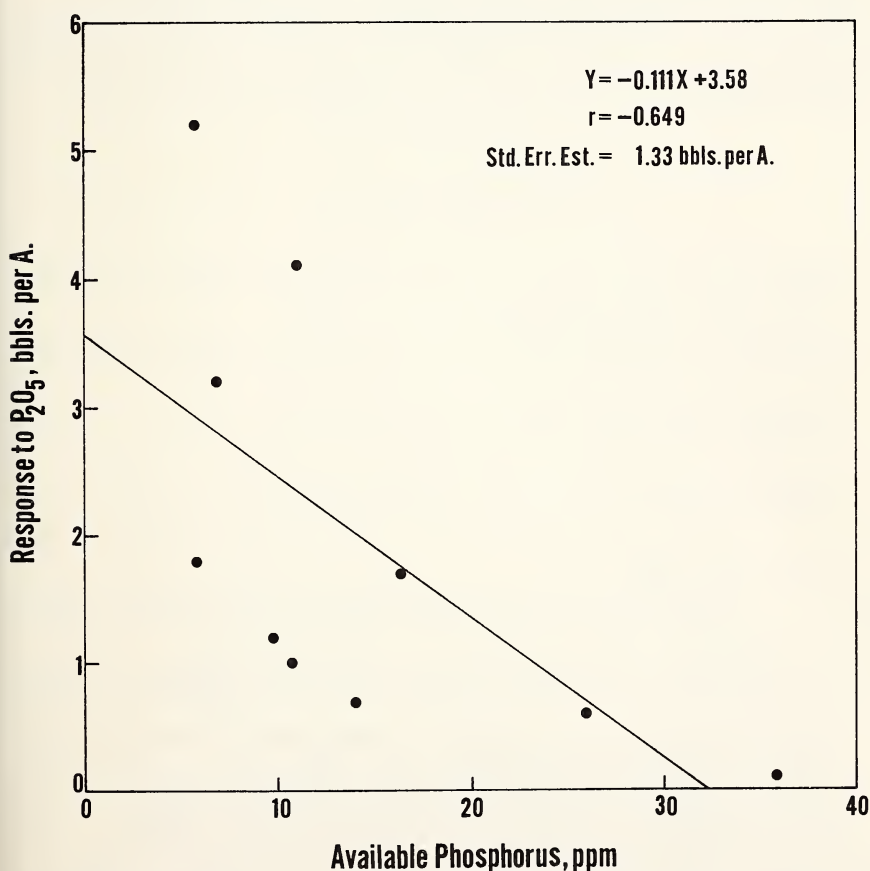


FIGURE 8.—Response of rice to  $P_2O_5$  as related to available soil phosphorus extracted at a 1:60 soil to extracting solution ratio.

practical routine. If the intersection of the horizontal response line equal to the standard error of estimate and the regression line (Figure 6) is established in the same manner as was done for potassium, rice grown on a soil from which 14 ppm or less of available phosphorus are extracted by the 1:20 ratio can be expected to give a response to added fertilizer phosphorus of from zero to 2.7 barrels per acre 84 percent of the time. By using this type of interpretation in Figure 7 when the 1:40 ratio is used, response to fertilizer phosphorus occurs at or below 19 ppm available soil phosphorus. Likewise, in Figure 8, when the 1:60 ratio is employed response begins at or below 21 ppm.

The data in Table 5 show that, in general, available phosphorus in the soils represented in the experiments was low, particularly in soils of the Oberlin, Crowley, and Caddo series. At 8 of the 10 experimental locations, the soil contained less than 14 ppm of available phosphorus. Among these locations, the response to fertilizer phosphorus varied from 0.6 to 5.2 barrels of rice per acre.

The data in Table 5 show that the soils were relatively low in available potassium. The soil at 6 of the 10 experimental locations contained less than 70 ppm available potassium. In 5 of the 6 locations, the response to fertilizer potassium varied from 1.3 to 3.7 barrels of rice per acre.

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# **The Retail Farm Supply Business In Louisiana**

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Washington, D. C.

## Foreword

This study of the retail farm supply business in Louisiana is one of five agribusiness studies contributing to a project under the general title, "An Economic Analysis of Problems Affecting the Success of Selected Small Agricultural Businesses in Louisiana." The other four phases are concerned with:

1. The retail farm equipment business in Louisiana.
2. Local grain elevators.
3. Feed and oil mills.
4. Local agricultural canning, packing, and processing plants.

These agribusinesses have problems peculiar to their close relationship to agriculture and, although they perform a very important service to farmers and the community, they have been relatively neglected in terms of economic research.

These studies are intended to provide a first look at these important agriculturally oriented small businesses in the state and to specifically recognize the incidence, magnitude, and nature of problems which confront them.

This research project was conducted by the Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, Louisiana State University, and financed in part by the Small Business Administration, Washington, D.C.

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# The Retail Farm Supply Business in Louisiana

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## Summary of Study

About 60 percent of the retail farm supply stores studied in Louisiana are single proprietorships. Corporation-type stores predominate in the larger store category.

Complementary enterprises are much more important than supplementary enterprises in the stores studied. More stores are tending to feed stock.

Many changes in their stores were desired by the operators—especially more retail and storage space.

The stores studied had not greatly expanded their trade area since 1951. They tended to serve fewer but larger farmers.

The average annual sales per store were \$57,000 for small, \$155,000 for medium, and \$365,000 for large stores. Feed, seed, and dry fertilizer accounted for about 80 percent of sales. New lines are handled to even out seasonality in sales. Yet, seasonality was still pronounced.

Sources of technical information varied. Trade journals were the most important single source.

Employee benefits were quite extensive and consisted of hospitalization insurance, paid vacations, and vehicles, among others.

Farm supply stores rely on numerous suppliers, oftentimes handling more than one brand per item. The problem of manufacturers by-passing them and selling direct to farmers was frequently cited.

Sales to city users and store-owned farms increased over the 1951 to 1961 period. Delivery of supplies to purchasers is very common.

Credit sales were an established method of operation. Although many problems were cited in connection with credit selling, few of the stores intended to stop this practice. In fact, many were planning to increase credit sales. Credit selling is a competitive tool which stores have had to adopt.

Markups on supplies sold were lowest on dry fertilizer and feed. In general, markups are under heavier pressure due to co-ops and discount store operations.

Long-term capital needs were not found to be critical. Store operators usually preferred to use their own equity capital for long-term expansion, thereby lessening the need for substantial mortgages.

Short-term capital was somewhat more critical. Banks were the primary source of short-term capital. Also, by using trade credit and consignment purchases, store operators lessened their short-term capital requirements.

Compared with national averages for retail farm supply stores, Louisiana stores had less favorable ratios for operating and payroll expense of sales, net profit as a percentage of sales, and net profit as a

percentage of net worth. However, large farm supply stores in Louisiana were far more successful than either medium or small stores. The large stores' financial ratios approximated the national average for retail farm supply stores.

The main problems reported by Louisiana farm supply store operators were: (1) manufacturer-wholesaler-retailer relationships, (2) effects of government farm programs, (3) the problem of co-op farm supply stores, (4) credit selling, and (5) store management, including employee training.

## Implications of Study

(1) The mortality rate among farm supply stores in Louisiana during recent years is believed to be high especially for smaller stores.

(2) The trend toward larger and more specialized farms has no doubt hurt the smaller, marginal farm supply store operator.

(3) Some stores, especially those close to the urban centers of population, have secured their economic positions somewhat by adding home and garden lines.

(4) The lack of a trade association among farm supply stores is a definite handicap. Such a trade association might aid in improving business management and might assist in numerous other ways.

(5) The gradual extension of credit operations by farm supply stores without corresponding sound credit policies has no doubt hurt some operators. The development and use of credit bureaus in some areas would help.

(6) The rapid development of co-op nonprofit farm supply services in Louisiana has added another dimension in competition for the farmers' supply business.

(7) Heavier capital requirements pose an obstacle to many supply stores since they are forced by competition to carry larger and more diversified inventories. In addition, stores are faced with the problem of adding new plants and equipment to keep present customers and develop new ones.

(8) Obtaining lines of credit is another formidable task for some supply store managers. When a supply store starts to lose sales in its community, it is not always easy to convince bankers that additional credit will help the store regain sales by offering better and more modern services and servicing.

(9) A hostility to government farm programs by some supply store operators poses another problem. In most instances, information is needed by them to properly appraise and evaluate these programs, some of which would be in their economic interest to understand properly. Present agricultural information agencies do not seem to be reaching them in most instances.



# The Retail Farm Supply Business in Louisiana

E. P. ROY AND B. E. WILLIAMSON\*

## Introduction

Production expenses on Louisiana farms amounted to \$291 million in 1959. About half of these expenses can be attributed to costs of farm supplies, which include feed, seed, fertilizer, tires, batteries, fuels, oils, greases, lubricants, crates, chemicals, veterinary supplies, building supplies, hardware, small tools, fencing, and miscellaneous items for the farm. The ratio of farm supply expenses to gross farm sales has been increasing from year to year as agriculture becomes more specialized and production more dependent upon industry-made inputs.

## Objectives of Study

The objectives of this study are:

- (1) To determine the types of economic problems involved in retailing farm supplies, their incidence, and their relative importance.
- (2) To suggest solutions to these problems where possible.
- (3) To identify areas in which additional research may be needed.

## Review of Literature

Although there is no evidence of experiment station research dealing with Louisiana farm supply stores, there have been studies in other regions concerned with this segment of agribusiness.

Dun and Bradstreet reported in 1956 that the typical farm supply store in the United States had sales of \$168,000 annually. Gross operating margins averaged 15.9 percent, total expenses 14.4 percent, and net profits 1.5 percent, before federal and state income taxes but after owners' compensation. Wages of employees constituted 4.8 percent of net sales while owners' compensation totaled 4.2 percent of net sales. The average store spent 0.3 percent of net sales for advertising. Bad debt losses were only 0.1 percent of net sales. Inventory turnover averaged 14.2 times per year for all stores surveyed.<sup>1</sup>

*The Eastern Feed Merchant* reported on a Dun and Bradstreet analy-

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<sup>1</sup>Elmer T. Siversten, *Farm Supply Stores: Operating Results in 1956*, Dun and Bradstreet, 99 Church Street, New York 8, New York, 1957.

sis which showed that management incompetence accounted for 44 percent of the business failures among retail farm supply stores; unbalanced experience of management, 19 percent; lack of managerial experience, 28 percent; and other causes, 9 percent. In other words, the "management" factor alone accounted for 91 percent of business failures.<sup>2</sup>

Mutti and Stone, in an Illinois study, found that 95 percent of the retail dealers were granting credit, 90 percent were delivering to farmers, 60 percent were granting quantity discounts, and 38 percent were custom grinding and mixing.<sup>3</sup>

Perregaux, in a New York study, found that average net sales per store amounted to \$88,000 with a gross margin of 11.6 percent of net sales. Expenses accounted for 10.6 percent of net sales, leaving 1.0 percent of net sales as net income. Perregaux also reported that a large volume of business was the most important factor for success. By having a large sales volume, economical large-scale purchases could be made. Most of the stores studied at that time granted credit.<sup>4</sup>

In a paper presented at the Illinois Agricultural Industries Forum in 1961, Fife reported that trends in agriculture point to fewer but better farm customers for farm supplies and equipment. The trends also indicate the need for better dealers serving larger farm patrons, numerous rural non-farm residents, and many part-time farmers.<sup>5</sup>

McKean, in a 1958 Upjohn Institute study, reported that, ever since 1900, small businesses have constituted from 85 to 90 percent of the total business population. In terms of assets or income generated, their proportion of the total is considerably more modest. In general, his findings imply that small businesses have been holding their place in the economy much better than is often assumed.<sup>6</sup>

The national Chamber of Commerce reported the following principal problems facing small businesses: (1) lack of adequate management, (2) adverse effects of taxation upon the procurement of equity capital, and (3) the accumulation of adequate reserves and internal funds.<sup>7</sup>

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<sup>2</sup>*Eastern Feed Merchant*, "Why Feed Businesses Fail," Garden State Building, Sea Isle City, New Jersey, February, 1961.

<sup>3</sup>R. J. Mutti and G. W. Stone, *Retail Feed Distribution in Illinois*, AE 2953, Urbana, Illinois, July, 1953.

<sup>4</sup>E. A. Perregaux, *Economic Study of Retail Feed Stores in New York*, Bulletin 471, New York Agricultural Experiment Station, Ithaca, New York, November, 1928.

<sup>5</sup>Lavon S. Fife, "Expectations in the Use and Productivity of Farm Supplies and Equipment," *Illinois Agricultural Industries Forum*, Urbana, Illinois, Spring, 1961.

<sup>6</sup>Eugene C. McKean, *The Persistence of Small Business*, W. E. Upjohn Institute for Community Research, 709 South Westnedge Avenue, Kalamazoo, Michigan, March, 1958.

<sup>7</sup>*Small Business: Its Role and Its Problems*, Chamber of Commerce of the United States, Washington, D.C., 1958.

## Method and Scope

A total of 165 farm supply stores were known to exist in Louisiana at the beginning of 1961, excluding the New Orleans metropolitan area, which extends over Orleans, St. Bernard, Plaquemines, and Jefferson parishes.<sup>8</sup> Farm supply stores in these four parishes were excluded from the study because the bulk of their sales consisted of pets, garden supplies, and household items.

A random sample consisting of one-third, or 55, of the 165 stores was selected (Figure 1). No attempt at size or geographic stratification was employed. A questionnaire (shown in Appendix B) was utilized for collecting information from the store manager or owner during the summer of 1961.

<sup>8</sup>A "parish" in Louisiana is equivalent to a "county" in other states.



FIGURE 1.—Location of 55 Farm Supply Stores Studied, Louisiana, 1961.

## Results of Study

The information on farm supply stores is classified by small, medium, and large stores. Size of store was based on annual dollar sales. Stores with annual sales of less than \$100,000 were classified as *small*; those with annual sales of from \$100,000 to \$250,000 were classified as *medium*; and those with over \$250,000 annual sales were termed *large*. Of the 55 stores selected for study, 20 were *small*, 18 were *medium*, and 17 were *large*.

### Aggregate Size of Farm Supply Business in Louisiana

Based on the sample of stores studied (excluding the stores in the New Orleans metropolitan area), the total farm supply store business in Louisiana may be summarized as follows:

- (1) Over 900 persons are employed by these stores, not including the storeowners.
- (2) Sales amounting to over \$30 million are made annually, of which close to \$2 million goes for employee wages.
- (3) Investments in land, buildings, and equipment are valued at \$5.8 million.

### Year Business Started

Over one-half (59 percent) of the large firms began operations before 1946 (Table 1). A little more than one-third started between 1946 and 1954 and only 6 percent after 1954. Almost two-thirds of the small and medium firms began operations after 1946. This suggests that the larger firms may have grown to their present large size from more humble beginnings.

### Form of Organization

As a whole, 60 percent of the firms began as single proprietorships, 35 percent as partnerships, and 5 percent as corporations (Table 1). In 1961, 18 out of 20 small firms were single proprietorships, 1 was a partnership, and 1 a corporation (Table 1). However, the medium and large firms were more likely to be partnerships and corporations, although 45 to 47 percent were still sole proprietorships.

Store operators suggested several reasons for changing to a corporation type of ownership. The reasons advanced were: death of partners, personnel changes, family considerations, and reduction of personal liability.



TABLE 1.—Year Business Started and Type of Ownership, 55 Farm Supply Stores, Louisiana, 1961

| Item                              | Size of Store <sup>1</sup> |      |        |      |       |      |
|-----------------------------------|----------------------------|------|--------|------|-------|------|
|                                   | Small                      |      | Medium |      | Large |      |
|                                   | No.                        | Pct. | No.    | Pct. | No.   | Pct. |
| Year Business Started             |                            |      |        |      |       |      |
| Before 1946                       | 7                          | 35   | 7      | 39   | 10    | 59   |
| 1946-1954                         | 9                          | 45   | 4      | 22   | 6     | 35   |
| After 1954                        | 4                          | 20   | 7      | 39   | 1     | 6    |
| Total                             | 20                         | 100  | 18     | 100  | 17    | 100  |
| Form of Organization (Originally) |                            |      |        |      |       |      |
| Single Proprietorship             | 13                         | 65   | 10     | 56   | 10    | 59   |
| Partnership                       | 6                          | 30   | 6      | 33   | 7     | 41   |
| Corporation                       | 1                          | 5    | 2      | 11   | 0     | 0    |
| Total                             | 20                         | 100  | 18     | 100  | 17    | 100  |
| Form of Organization (1961)       |                            |      |        |      |       |      |
| Single Proprietorship             | 18                         | 90   | 8      | 45   | 8     | 47   |
| Partnership                       | 1                          | 5    | 4      | 22   | 4     | 24   |
| Corporation                       | 1                          | 5    | 6      | 33   | 5     | 29   |
| Total                             | 20                         | 100  | 18     | 100  | 17    | 100  |

<sup>1</sup>For a definition of size of store, see page 8.

## **Plant Ownership and Leasing Arrangements**

Most of the small and large firms owned the land on which their businesses were located. Most of the medium firms leased their land. Only about one-fourth of the owners preferred to lease rather than own their properties. Others leased because present owners would not sell. About 16 percent of the firms owned the buildings even though the land was leased. Only 4 percent of the firms leased office or other equipment, and these were all medium size firms (Appendix Table 1).

## **Capital to Enter the Business**

Owners of small stores reported that it would require about \$18,500 to start at their present scale of operation. Owners of medium size stores reported a capital requirement of \$26,500, while owners of large stores reported that it would require \$77,500 to enter at their present scale of operation. The average for all stores was \$40,000.

## **Related Business Operations**

Farm supply stores are frequently operated in conjunction with other businesses, such as livestock production, feed mills, grocery stores, and wholesale feed sales (Table 2). On occasion a farm supply store was found to be operating jointly with a plant nursery, a seed cleaning establishment, a chemical plant, a grain elevator, or a fertilizer plant. In addition to ownership in closely related businesses, operators of farm supply stores frequently had an ownership interest in many nonfarm businesses in their communities.

The main type of complementary enterprise for small size stores was feeder stock production. Medium size supply stores usually had a grocery store, wholesale feedhouse, or feeder stock operation. Large firms were more likely to have a feed mill or feeder stock operation as a complementary type of enterprise. Almost two-thirds of the store owners had ownership interest in two or more additional types of businesses (Table 2).

## **Desired Changes in Store Operations**

Interview responses by store operators indicated that if the farm supply stores were to be rebuilt, the following changes would be made: (1) enlarge the store, (2) enlarge the storage space, and (3) use brick, metal, or concrete for the building. Building materials of brick, metal, or concrete were about equally preferred as building materials. Other changes suggested as desirable improvements were: construction of elevated loading docks, installation of fire sprinkler system, ready access to a railroad, and use of more modern equipment (Table 3).

**TABLE 2.—Incidence of Multiple Plant Operations, 55 Farm Supply Stores, by Size of Store, Louisiana, 1961**

| Operation                                   | Size of Store    |                 |                 | Total           |
|---------------------------------------------|------------------|-----------------|-----------------|-----------------|
|                                             | Small            | Medium          | Large           |                 |
|                                             | Number of Stores |                 |                 |                 |
| With supplementary enterprises <sup>a</sup> | 4                | 6               | 3               | 13              |
| With complementary enterprises <sup>b</sup> | 10               | 19              | 21              | 50              |
| Total                                       | 14               | 25 <sup>c</sup> | 24 <sup>c</sup> | 63 <sup>c</sup> |

<sup>a</sup>Includes interest in insurance agency, feed store, appliance store, grocery store, laundry, or sugar mill.

<sup>b</sup>Includes interest in feeder stock production, building supplies, nursery, seed cleaning, wholesale feed store, feed mill, chemical plant, grain elevator, wholesale grocery, or fertilizer plant.

<sup>c</sup>Some stores reported ownership interest in more than one type of related enterprise.

**TABLE 3.—Changes Desired by Current Operators, 55 Farm Supply Stores, Louisiana, 1961**

| Changes Desired                  | Size of Store |        |       | Total |
|----------------------------------|---------------|--------|-------|-------|
|                                  | Small         | Medium | Large |       |
|                                  | Percent       |        |       |       |
| Enlarge store                    | 15            | 24     | 18    | 18    |
| Enlarge storage area             | 10            | 19     | 17    | 15    |
| Install sprinkler system         | 15            | 5      | 4     | 8     |
| Elevate docks                    | 7             | 8      | 7     | 7     |
| Build more durable structure     | 22            | 24     | 10    | 18    |
| Closer to railroad               | 7             | 3      | 8     | 6     |
| Modernize equipment              | 8             | 0      | 8     | 6     |
| All under one roof               | 2             | 3      | 7     | 4     |
| More parking space               | 2             | 5      | 4     | 4     |
| Install showroom or display area | 4             | 3      | 2     | 3     |
| Move outside city                | 2             | 0      | 7     | 3     |
| Build on own land                | 2             | 3      | 2     | 2     |
| Build bulk station               | 2             | 0      | 2     | 2     |
| Self-service store               | 0             | 0      | 4     | 2     |
| Use removable interior walls     | 2             | 3      | 0     | 2     |
| Total                            | 100           | 100    | 100   | 100   |

Anyone planning to enter or expand the farm supply business should be aware of the deficiencies reported by owners or managers of existing establishments. A greater capital investment will be necessary to avoid these shortcomings and the decision to build a more permanent structure would have to be weighed against the uncertainties of the future. Once a large sum of funds is committed to a fixed investment, liquidation or changes in plans become more difficult.

## Extent of Service Area

Farm supply stores are naturally more prevalent in the truly agricultural regions of the state, and the geographic area served by any given store depends on a complexity of factors. No effort is made here to identify or discuss those factors but rather to express in physical terms the size of area served by farm supply stores.

In general, small firms most frequently served three parishes, whereas medium and large firms usually served four parishes (Appendix Table 2).

The average number of parishes served by a farm supply store in 1961 was about the same as 10 years earlier, with the exception that, on the average, the large stores had expanded their service areas to include an additional parish.

The number of parishes needed to do a specified volume of business will vary with type of farming area and other factors. The average radius served by small farm supply stores was 13.7 miles, medium stores served 21.1 miles, and large size stores served 31.0 miles. Apparently the average radius is directly related to business volume (Appendix Table 2).

## Growth of Firms and Sales Volume

Of the 20 small stores interviewed in 1961, 11 would have been classified as small in 1950, 4 would have been considered of medium size, and 5 were nonexistent. About one-third of the 18 stores classified as medium in 1961 had entered the business since 1950, 4 others were small, 1 was large, and only 7 were medium at that time.

Only 3 of the 17 large firms entered the business since 1950. Seven were already large 10 years ago, 4 were medium, and 3 were small (Table 4).

## Kinds and Volume of Sales

Annual sales per store in 1961 averaged \$56,848 for small, \$155,117 for medium, and \$365,197 for large (Table 5).

The three main items comprising sales of farm supply stores were feed, seed, and dry fertilizers. However, the order of importance varied by size of store. Feed always accounted for highest dollar volume of sales. For small stores, the rank by dollar volume of sales was feed, seed, dry fertilizer, chemicals, containers, home and garden supplies, and hardware (Table 5).

For medium size stores the order of importance by dollar volume of sales was feed, dry fertilizer, seed, machinery and equipment, chemicals, and hardware.



TABLE 4.—Changes in Stores' Business Volume Over Time, 55 Farm Supply Stores, Louisiana, 1961

| Item                   | Size of Store |      |        |      |       |      |       |      |
|------------------------|---------------|------|--------|------|-------|------|-------|------|
|                        | Small         |      | Medium |      | Large |      | Total |      |
|                        | No.           | Pct. | No.    | Pct. | No.   | Pct. | No.   | Pct. |
| Size of Business: 1950 |               |      |        |      |       |      |       |      |
| Small                  | 11            | 55   | 4      | 22   | 3     | 18   | 18    | 33   |
| Medium                 | 4             | 20   | 7      | 39   | 4     | 23   | 15    | 27   |
| Large                  | 0             | 0    | 1      | 6    | 7     | 41   | 8     | 15   |
| Not in business        | 5             | 25   | 6      | 33   | 3     | 18   | 14    | 25   |
| Total                  | 20            | 100  | 18     | 100  | 17    | 100  | 55    | 100  |
| Size of Business: 1961 |               |      |        |      |       |      |       |      |
| Small                  | 15            | 75   | 2      | 11   | 1     | 6    | 18    | 33   |
| Medium                 | 3             | 15   | 9      | 50   | 6     | 35   | 18    | 33   |
| Large                  | 0             | 0    | 2      | 11   | 10    | 59   | 12    | 22   |
| Not in business        | 2             | 10   | 5      | 28   | 0     | 0    | 7     | 12   |
| Total                  | 20            | 100  | 18     | 100  | 17    | 100  | 55    | 100  |

TABLE 5.—Kinds and Volume of Farm Supply Sales, 55 Farm Supply Stores, Louisiana, 1961

| Item                | Small               |              | Medium              |              | Large               |              | Total               |              |
|---------------------|---------------------|--------------|---------------------|--------------|---------------------|--------------|---------------------|--------------|
|                     | Total<br>Sales (\$) | Per-<br>cent | Total<br>Sales (\$) | Per-<br>cent | Total<br>Sales (\$) | Per-<br>cent | Total<br>Sales (\$) | Per-<br>cent |
| Feed                | 595,950             | 52.4         | 1,038,463           | 37.2         | 3,153,411           | 50.8         | 4,787,824           | 47.2         |
| Seed                | 158,945             | 14.0         | 490,976             | 17.6         | 735,084             | 11.8         | 1,385,005           | 13.7         |
| Dry fertilizer      | 147,104             | 12.9         | 674,324             | 24.2         | 1,070,801           | 17.2         | 1,892,229           | 18.7         |
| Liquid fertilizer   | 9,100               | .8           | 0                   | —            | 0                   | —            | 9,100               | .1           |
| Chemicals           | 73,922              | 6.5          | 130,348             | 4.7          | 244,864             | 3.9          | 449,134             | 4.4          |
| Vet. Supplies       | 17,448              | 1.5          | 49,840              | 1.8          | 108,524             | 1.7          | 175,812             | 1.7          |
| Petroleum           | 1,751               | .2           | 5,150               | .2           | 12,968              | .3           | 19,869              | .2           |
| Building materials  | 976                 | .1           | 24,180              | .9           | 0                   | —            | 25,156              | .2           |
| Machinery-equipment | 1,520               | .1           | 152,960             | 5.4          | 153,100             | 2.5          | 307,580             | 3.0          |
| Hardware            | 21,727              | 1.9          | 69,908              | 2.4          | 276,038             | 4.4          | 367,673             | 3.6          |
| T.B.A. <sup>a</sup> | 0                   | —            | 1,064               | *            | 0                   | —            | 1,064               | *            |
| Containers          | 31,942              | 2.8          | 11,150              | .4           | 7,065               | .2           | 50,157              | .5           |
| Home garden         | 28,270              | 2.5          | 32,870              | 1.2          | 247,196             | 4.0          | 308,336             | 3.1          |
| Steel               | 5,098               | .5           | 22,580              | .8           | 62,960              | 1.0          | 90,638              | .9           |
| Other <sup>b</sup>  | 43,211              | 3.8          | 88,293              | 3.2          | 136,345             | 2.2          | 267,849             | 2.7          |
| Total               | 1,136,964           | 100.0        | 2,792,106           | 100.0        | 6,208,356           | 100.0        | 10,137,426          | 100.0        |
| Sales per store     | 56,848              | —            | 155,117             | —            | 365,197             | —            | 104,317             | —            |

<sup>a</sup>Tires, batteries, and accessories.<sup>b</sup>Groceries, baby chicks, marine supplies, poultry and dairy supplies, saddlery, live poultry, appliances, and miscellaneous.

\*Less than .1 percent.

For large size stores the rank was feed, dry fertilizer, seed, hardware, home and garden supplies, chemicals, machinery and equipment, and veterinary supplies.

Ninety-five percent of all stores sold feed and seed. Eighty-seven percent sold dry fertilizer and 76 percent sold chemicals. Other items frequently sold in many farm supply stores were veterinary supplies, home and garden supplies, and hardware. Liquid fertilizer was handled by only one store in the sample (Appendix Table 3).

## Changes in Types of Supplies and Services

The store operators were asked to cite those items which have been added to or removed from their inventory or service program since 1955. Those items added, in order of importance, were: insecticides and chemicals, garden supplies, hardware items, nursery items, veterinary supplies, egg handling, garden tractors, paints, dairy supplies, and field seeds.

Items dropped, in order of importance, were: insecticides and chemicals, dry fertilizer, hay and feeds. Contract growing of broilers had been dropped in one instance.

## Seasonality of Sales

In general, farm supply sales are seasonal. The second quarter (April-June) is busiest with 31.7 percent of the annual sales. The third quarter (July-September) is the slowest season with only 18.8 percent of the annual sales. The first and fourth quarters each have about one-fourth of the annual sales (Table 6).

Seasonality of sales has many implications and, sometimes, complications. Credit, inventory warehousing, and labor requirements are all affected by seasonality. Seasonality is a problem in most business ventures. However, most farm supply store owners indicate they had added new lines to even out seasonality of sales. The most common action taken by farm supply stores to smooth out seasonal fluctuation in sales was to introduce home and garden supplies.

**TABLE 6.—Seasonality of Farm Supply Sales, 55 Farm Supply Stores, Louisiana, 1961**

| Season           | Size of Store    |        |       | Total |
|------------------|------------------|--------|-------|-------|
|                  | Small            | Medium | Large |       |
|                  | Percent of Sales |        |       |       |
| January-March    | 24.5             | 29.0   | 24.0  | 25.8  |
| April-June       | 34.0             | 28.5   | 32.5  | 31.7  |
| July-September   | 16.5             | 21.5   | 18.5  | 18.8  |
| October-December | 25.0             | 21.0   | 25.0  | 23.7  |
| Total            | 100.0            | 100.0  | 100.0 | 100.0 |

## Sources of Technical Information

Store operators obtain technical information from various sources. Managers of small size stores indicated they obtained their information mostly from trade journals and government reports. Six small firms indicated they used no technical information.

Medium and large size firms depended more on county agents and agricultural experiment stations for their information. Commercial company literature was used less as the size of the business increased. Medium and large firms were more likely to use sources of technical information than the small firms (Appendix Table 4).

## Number of Employees

The average number of employees per firm was 3.4 for small firms, 4.9 for medium, and 8.5 for large size firms. The manager in medium and small firms often performed a wide variety of store functions. In large firms, the trucking function used the largest number of employees. Management and warehousing were of next importance in terms of number of employees.

Turnover in the labor force averaged 11 percent annually for all firms. This figure was 10 percent for small, 14 percent for medium, and 9 percent for large size firms (Table 7).

## Employee Benefits

One-half of the small firms provided some type of employee benefits, and of those who did only one-half offered hospitalization and insurance.

Sixty-one percent of the medium size firms offered employee benefits. About 10 percent furnished vehicles and 17 percent offered perquisites in addition to those furnished by small size farms.

All large size firms offered employee benefits. The most common type of fringe benefit was the paid vacation (Table 7).

## Employee Problems

Employee problems frequently mentioned by store operators were: (1) not dependable, (2) poor technical knowledge, and (3) wage demands too high. Inadequate knowledge of insecticides, fertilizers, and other chemicals was often cited as a weakness of employees.

Eighty percent of the small firms, 94 percent of the medium, and 70 percent of the large firms reported no employee problems. As a group 82 percent of the farm supply stores reported no employee problems.



**TABLE 7.—Employee Benefits, Labor Problems Encountered and Number of Employees, 55 Farm Supply Stores, Louisiana, 1961**

| Item                               | Size of Store                           |        |       | Total |
|------------------------------------|-----------------------------------------|--------|-------|-------|
|                                    | Small                                   | Medium | Large |       |
|                                    | — — — Average Number of Employees — — — |        |       |       |
| Type of Work                       |                                         |        |       |       |
| Management                         | 1.0                                     | 1.3    | 1.5   | 1.3   |
| Office work                        | .3                                      | .6     | 1.0   | .6    |
| Sales                              | .5                                      | .8     | 1.3   | .8    |
| Service                            | .2                                      | .8     | 1.2   | .7    |
| Warehousing                        | .7                                      | .5     | 1.5   | .9    |
| Trucking                           | .7                                      | .9     | 2.0   | 1.2   |
| Total                              | 3.4                                     | 4.9    | 8.5   | 5.5   |
| Turnover on annual basis (percent) | 10                                      | 14     | 9     | 11    |
|                                    | — — — — — Number of Stores — — — — —    |        |       |       |
| Benefits for Employees             |                                         |        |       |       |
| None provided                      | 10                                      | 7      | 0     | 17    |
| Do provide benefits:               | 10                                      | 11     | 17    | 38    |
| Insurances and hospitalization     | 5                                       | 5      | 9     | 19    |
| Bonuses (Incentives)               | 3                                       | 7      | 9     | 19    |
| Paid vacations                     | 7                                       | 7      | 14    | 28    |
| Vehicles                           | 0                                       | 2      | 7     | 9     |
| Perquisites                        | 0                                       | 3      | 5     | 8     |
| Problems with Employees            |                                         |        |       |       |
| Not dependable                     | 2                                       | 0      | 1     | 3     |
| Lack knowledge                     | 1                                       | 0      | 2     | 3     |
| High demands                       | 1                                       | 1      | 2     | 4     |
| No problems reported               | 16                                      | 17     | 12    | 45    |

## Number of Store Suppliers

Farm supply stores obtain supplies from many firms. In feeds, for example, an average of four different suppliers may be used, some for ready-mix feeds, another for dog food, another for wheat shorts, and perhaps another for special type feeds or feed products. Machinery and equipment items, chemicals, seeds, and garden supplies are lines with the most suppliers, while liquid fertilizer, petroleum, oils and greases, tires, batteries, and accessories are the commodities with the fewest number of suppliers per store (Table 8).

## Manufacturer's By-Passing Retail Outlets

Eighty percent of all stores reported that farmers were frequently buying directly from manufacturers. Ninety-four percent of the large, 67 percent of the medium, and 80 percent of small stores reported this growing tendency. It is surprising to note that the larger stores were more conscious of this trend than small and medium stores, especially

since large stores tend to provide farmers with large volumes and at lower costs than do smaller stores.

## Distribution of Farm Supply Sales

Seventy-three percent of all farm supply sales went to farmers (Table 9). A larger proportion of sales by small firms went to city users than sales by medium and large firms.

Size of business was directly related to the amount of sales through company-owned feeder stock. Supplying store-owned feeder stock ac-

**TABLE 8.—Average Number of In-State and Out-of-State Firms Furnishing Farm Supplies to 55 Farm Supply Stores, Louisiana, 1961**

| Item                   | Average Number of Suppliers Per Store |             |                  |
|------------------------|---------------------------------------|-------------|------------------|
|                        | Intra-state                           | Inter-state | Combined Average |
| Feed                   | 1.9                                   | 1.8         | 3.7              |
| Seed                   | 2.2                                   | 2.4         | 4.6              |
| Dry fertilizer         | 1.8                                   | 1.4         | 3.2              |
| Liquid fertilizer      | 1.0                                   | 0           | 1.0              |
| Chemicals              | 2.4                                   | 2.6         | 5.0              |
| Veterinary supplies    | 1.7                                   | 1.9         | 3.6              |
| Petroleum              | 1.0                                   | 0           | 1.0              |
| Oil-grease             | 1.0                                   | 0           | 1.0              |
| Containers             | 1.6                                   | 1.0         | 2.6              |
| Machinery-equipment    | 2.0                                   | 4.3         | 6.3              |
| Garden supplies        | 2.6                                   | 2.0         | 4.6              |
| Tires, batteries, etc. | 2.0                                   | 0           | 2.0              |
| Building materials     | 1.8                                   | 1.7         | 3.5              |

**TABLE 9.—Distribution of Farm Supply Sales and Delivery, 55 Farm Supply Stores, Louisiana, 1961**

| Type of Purchaser     | Size of Store                 |        |       |       |
|-----------------------|-------------------------------|--------|-------|-------|
|                       | Small                         | Medium | Large | Total |
|                       | Percentage of Sales           |        |       |       |
| Farm producers        | 76                            | 73     | 72    | 73    |
| City customers        | 18                            | 8      | 12    | 12    |
| Other retailers       | 2                             | 13     | 6     | 7     |
| Store-owned livestock | 3                             | 6      | 9     | 7     |
| Others <sup>a</sup>   | 1                             | 0      | 1     | 1     |
| Total                 | 100                           | 100    | 100   | 100   |
|                       | Percentage of Sales Delivered |        |       |       |
| Farm producers        | 32                            | 53     | 67    | 59    |
| City customers        | 29                            | 31     | 29    | 29    |
| Other retailers       | 38                            | 44     | 46    | 45    |
| Store-owned livestock | 100                           | 100    | 96    | 97    |
| Others <sup>a</sup>   | 0                             | 0      | 100   | 100   |

<sup>a</sup>State and federal agencies.

counted for 3 percent of sales of small stores, 6 percent of sales by medium stores, and 9 percent of sales by large stores. Marketing farm supplies through store-owned feeder stock has become a more common practice. Sales to city users have also increased.

## Sales Delivery

Delivery of supplies to farmers was more common for large firms than for small firms. About 32 percent of sales by small firms were delivered, as compared with 53 percent of sales by medium firms and 67 percent of sales by large firms. The percent of sales delivered to city customers was about 30 percent for each size firm (Table 9).

Although not required by all customers, delivery seems to be a necessary service of farm supply stores. This added cost must be absorbed as general overhead or charged to customers through lower discounts or higher prices. High delivery costs are a constant problem for farm supply stores, especially in cases of low volume purchases.

## Credit Sales

Small firms made 38 percent of sales on credit while the medium size firms had 30 percent credit sales, and large size firms sold 57 percent on credit (Table 10). These differences in use of credit may be the clue to various financing problems. It is not known whether these differences result from (1) customer's desire for credit, (2) desire of the farm supply store to extend credit, or (3) financial ability of the farm supply store to extend credit. Credit sales are discussed further in a later section.

## Cash and Volume Discounts

Twenty-four percent of all firms offered cash discounts. Discounts on cash sales ranged from 2 to 10 percent.

Twenty-seven percent of all firms offered volume discounts. A smaller proportion of small firms gave a volume discount than did medium or large firms. Discounts for store pickups, instead of delivery, was also more commonly practiced by the larger stores.

**TABLE 10.—Percentage of Credit Sales by 55 Farm Supply Stores, Louisiana, 1961**

| Type of Sale          | Size of Store       |        |       | Total |
|-----------------------|---------------------|--------|-------|-------|
|                       | Small               | Medium | Large |       |
|                       | Percentage of Sales |        |       |       |
| Cash                  | 62                  | 70     | 43    | 53    |
| Credit (Over 30 days) | 38                  | 30     | 57    | 47    |
| Total                 | 100                 | 100    | 100   | 100   |

## Markups on Farm Supplies

Markups among supply items varied. Markups ranged from zero for dry fertilizers (for some firms) to 100 percent for garden seeds. The average markup for all stores was lowest on dry fertilizers, and increased for feeds, field seeds, and chemicals, in that order (Table 11).

## Advertising Expenditures

Twenty-five percent of small stores, 22 percent of medium, and 18 percent of large stores did no advertising. Fifty percent of the small and medium firms spent less than one percent of the gross sales on advertising. About one-half of the large firms spent from 1 to 3 percent of the gross sales on advertising (Appendix Table 5).

In many cases advertising was difficult to distinguish from charity to local groups or strictly promotional efforts of the firm.

## Practices Affecting Feed Sales

On-farm feed mixing gave about one-third of the small and medium firms some concern. Only 18 percent of large firms were concerned about on-farm feed mixing.

Twenty percent of small firms, 28 percent of medium, and only 6 percent of large firms (one firm) were rating competition from mobile feed mixing.

Thirty percent of small firms, 28 percent of medium, and only 12 percent of large firms were affected by bulk feeding. Bulk feed handling is done mostly by feed mills directly to farmers.

Forty percent of the small firms, 50 percent of the medium, and 59 percent of the large firms planned company feeding of stock as an outlet for feed.

## Short-Term Financing

Short-term financing is defined as those loans which were for one year or less.

**Sources of Capital**—Thirty percent of small, 61 percent of medium, and 35 percent of large firms did not borrow short-term capital. Medium size firms seemed to be in a better financial position although not necessarily in a more profitable position than large firms.

Banks were the primary sources of short-term capital for all size firms (Table 12).

**Security Required**—About 70 percent of small and large firms borrowed on signature only while 86 percent of the medium firms that



TABLE 11.—Percentage Markups on Farm Supplies, 55 Farm Supply Stores, Louisiana, 1961

| Supplies               | Size of Store |         |        |                             |        |         |
|------------------------|---------------|---------|--------|-----------------------------|--------|---------|
|                        | Small         |         | Medium |                             | Large  |         |
|                        | Range         | Average | Range  | Average                     | Range  | Average |
| Feed                   | 6-20          | 13      | —      | Percent Markup <sup>a</sup> | —      | —       |
| Dry fertilizer         | 0-15          | 9       | 7-25   | 14                          | 7-25   | 14      |
| Garden seeds           | 15-125        | 53      | 5-10   | 8                           | 0-15   | 8       |
| Field seeds            | 10-20         | 14      | 20-100 | 52                          | 25-100 | 68      |
| Chemicals              | 5-40          | 26      | 10-35  | 17                          | 10-30  | 18      |
| Veterinary supplies    | 25-40         | 32      | 5-50   | 26                          | 10-40  | 26      |
| Steel products         | 15-33         | 26      | 20-50  | 34                          | 25-40  | 32      |
| Tires, batteries, etc. | —             | —       | 20-40  | 28                          | 10-40  | 24      |
| Hardware               | —             | —       | 25-35  | 30                          | —      | —       |
| Building materials     | —             | —       | 20-40  | 30                          | 20-50  | 30      |
|                        |               |         | 20-40  | 30                          | 5-25   | 15      |

<sup>a</sup>Based on purchasing cost.

borrowed short-term capital borrowed on signature. Chattel mortgages, with one exception, were the remaining securities offered (Table 12).

**Interest Rates**—Short-term interest varied from 5 to 8 percent. Six percent was the rate paid by most of the small, medium, and large firms. Average short-term interest rates were about the same for different sizes of firms. However, none of the larger firms paid as much as 8 percent (Table 12).

**Length of Loans**—A greater number of small firms had loans of one year. For medium size firms, the two most common lengths of loans were 90 days and one year. More large size firms tended to use the 90-day loan (Table 12).

**TABLE 12.—Short-Term Financing by 55 Farm Supply Stores, Louisiana, 1961**

| Item               | Size of Store |      |        |      |       |      |       |      |
|--------------------|---------------|------|--------|------|-------|------|-------|------|
|                    | Small         |      | Medium |      | Large |      | Total |      |
|                    | No.           | Pct. | No.    | Pct. | No.   | Pct. | No.   | Pct. |
| Source of Capital  |               |      |        |      |       |      |       |      |
| Banks              | 13            | 65   | 7      | 39   | 10    | 59   | 30    | 54   |
| Individuals        | 0             | —    | 0      | —    | 1     | 6    | 1     | 2    |
| Trade              | 1             | 5    | 0      | —    | 0     | —    | 1     | 2    |
| None borrowed      | 0             | —    | 0      | —    | 0     | —    | 0     | —    |
| No reply           | 6             | 30   | 11     | 61   | 6     | 35   | 23    | 42   |
| Total              | 20            | 100  | 18     | 100  | 17    | 100  | 55    | 100  |
| Security Required  |               |      |        |      |       |      |       |      |
| Signature          | 9             | 69   | 6      | 86   | 7     | 70   | 22    | 73   |
| Chattel mortgage   | 3             | 23   | 1      | 14   | 3     | 30   | 7     | 24   |
| Stock certificates | 1             | 8    | 0      | —    | 0     | —    | 1     | 3    |
| Total              | 13            | 100  | 7      | 100  | 10    | 100  | 30    | 100  |
| Interest Rates     |               |      |        |      |       |      |       |      |
| 5 percent          | 1             | 8    | 1      | 14   | 2     | 20   | 4     | 13   |
| 6 percent          | 9             | 69   | 4      | 57   | 7     | 70   | 20    | 67   |
| 7 percent          | 0             | —    | 0      | —    | 1     | 10   | 1     | 3    |
| 8 percent          | 3             | 23   | 2      | 29   | 0     | —    | 5     | 17   |
| Total              | 13            | 100  | 7      | 100  | 10    | 100  | 30    | 100  |
| Repayment Schedule |               |      |        |      |       |      |       |      |
| Monthly            | 6             | 47   | 1      | 14   | 2     | 20   | 9     | 30   |
| 90 days            | 2             | 15   | 4      | 57   | 6     | 60   | 12    | 40   |
| 180 days           | 2             | 15   | 1      | 14   | 2     | 20   | 5     | 17   |
| Annual             | 3             | 23   | 1      | 15   | 0     | —    | 4     | 13   |
| Total              | 13            | 100  | 7      | 100  | 10    | 100  | 30    | 100  |
| Length of Loan     |               |      |        |      |       |      |       |      |
| 30 days            | 2             | 15   | 0      | —    | 0     | —    | 2     | 6    |
| 90 days            | 3             | 23   | 3      | 43   | 5     | 50   | 11    | 37   |
| 180 days           | 3             | 23   | 1      | 14   | 2     | 20   | 6     | 20   |
| 360 days           | 5             | 39   | 3      | 43   | 3     | 30   | 11    | 37   |
| Total              | 13            | 100  | 7      | 100  | 10    | 100  | 30    | 100  |

**Repayment Terms**—More small firms repaid their loans on a monthly basis while medium and large size firms repaid mostly on a 90-day basis. The greater capital requirements of medium and large size firms probably led to more difficulty in budgeting their cash flow. The business fluctuations would be smoothed out better over a 90-day period. Therefore, this repayment schedule was more convenient for the larger stores.

## Intermediate to Long-Term Financing

Intermediate to long-term financing, as used in this study, is defined as loans extending from one to five years.

**Sources of Capital**—Banks were used as a source of intermediate to long-term financing by 35 percent of the small, 22 percent of the medium, and 18 percent of the large size firms. For all sizes of firms, 24 percent used banks as a source of long-term funds (Table 13).

Forty-five percent of the small, 66 percent of the medium, and 76 percent of the large firms furnished their own capital. The other firms obtained funds from relatives, building and loan companies, insurance companies, Small Business Administration, and the Production Credit Associations.

**Interest Rates**—Six percent was the most common interest rate paid by small and large firms while most medium size stores paid only 5 percent. The range of interest rates was from 5 to 8 percent annually. One reason for the lower interest rate for medium size firms may be that they did not borrow up to their capacity. By not using the principle of leverage, their loans were not as risky.

**Length of Loans**—The length of loans varied from one to five years. The same proportion of small size firms had loans of one, three, and five years while one small firm had a loan of two years. Half of the

**TABLE 13.—Sources of Intermediate to Long-Term Financing by 55 Farm Supply Stores, Louisiana, 1961**

| Sources of<br>Funds           | Size of Store |            |           |         |
|-------------------------------|---------------|------------|-----------|---------|
|                               | Small         | Medium     | Large     | Total   |
|                               | — — — —       | Percentage | of Stores | — — — — |
| Banks                         | 35            | 22         | 18        | 24      |
| Family/individual             | 5             | —          | 6         | 4       |
| Building and loan             | 5             | 6          | —         | 4       |
| Insurance companies           | 5             | —          | —         | 2       |
| Small Business Administration | 5             | —          | —         | 2       |
| Production Credit Association | —             | 6          | —         | 2       |
| None                          | 45            | 66         | 76        | 62      |
| Total                         | 100           | 100        | 100       | 100     |

medium size firms had loans of one year, while the other half was divided between two and five year loans. Large firms borrowed for longer periods of time. Their loans were from three to five years.

**Repayment Terms**—The only repayment schedules reported were monthly and annually. Fifty-seven percent of small firms, 50 percent of medium, and 33 percent of large firms repaid their long-term debt on a monthly basis. (These percentages are based on those who had long-term loans outstanding.)

**Adequate Sources of Capital**—All small firms indicated that they had adequate sources of capital. Only one medium and one large firm indicated that they did not have access to adequate intermediate to long-term capital.

Store owners did not feel that sources of capital were unavailable or inadequate. Most of them felt that if they needed capital and desired it, it was readily available on favorable terms, in their opinion.

## Consignment of Supplies

The main items obtained by consignment were dry fertilizer, chemicals, and seed. There was no difference among sizes of stores as to consignment items or number of stores reporting consignment of supplies. It is important to notice, however, that the primary item consigned was fertilizer. Because of the low profit margin per dollar invested in fertilizer, managers of farm supply stores choose to invest their limited capital in items which do not tie up so much capital (Appendix Table 6).

## Extending Credit to Customers

Extension of credit to customers seems to be a broad problem area. Bad debt losses and administrative costs of credit extension create problems for the farm supply store.

Eighty percent of the small firms, 83 percent of the medium, and 94 percent of the large size firms extended credit to at least some customers. About half of the stores of each size group had no policy on credit extension. The most common lengths of credit extension were: (1) every 30 days and (2) at end of crop year. Only about 20 percent of all firms specified a maximum amount of credit which each customer could obtain. The security required varied widely. Most of the stores required no security by the purchaser (Table 14).

**Bad Debt Loss**—The bad debt loss of most firms was 2 percent or less of credit sales. Fifteen percent of small stores, 11 percent of medium stores, and 6 percent of large stores had a credit loss of from 3 to 5



percent of credit sales. Twelve percent of large stores had a bad debt loss of from 6 to 10 percent. One small and one medium store had credit losses of over 10 percent (Appendix Table 7).

This indicates a critical problem area for farm supply stores. However, a majority of firms indicated that they planned to expand credit. Only about one-fourth of the firms used the services of credit bureaus.

The main reason for bad debt losses was attributed to lack of investigation of customers' credit status (Appendix Table 8). Problems in collecting delinquent accounts were also cited.

## Financial and Operating Ratios

Certain financial and operating ratios reveal the general condition of a business firm. Although these ratios may not measure exact efficiency, they do give a fairly clear picture of the relative positions of business firms.

**Fixed Assets Per Employee**—Fixed assets per employee amounted to \$5,379 for small firms, \$5,867 for medium firms, and \$7,372 for large firms (Table 15). These ratios, compared with the \$5,000 per employee for the average farm supply store in the United States, indicate that farm supply stores in Louisiana either have an excess of fixed assets

**TABLE 14.—Characteristics of Customer Credit, As Reported by 55 Farm Supply Stores, Louisiana, 1961**

| Item               | Size of Store |      |        |      |       |      |       |      |
|--------------------|---------------|------|--------|------|-------|------|-------|------|
|                    | Small         |      | Medium |      | Large |      | Total |      |
|                    | No.           | Pct. | No.    | Pct. | No.   | Pct. | No.   | Pct. |
| Credit Extended    |               |      |        |      |       |      |       |      |
| Yes                | 16            | 80   | 15     | 83   | 16    | 94   | 47    | 85   |
| No                 | 4             | 20   | 3      | 17   | 1     | 6    | 8     | 15   |
| Total              | 20            | 100  | 18     | 100  | 17    | 100  | 55    | 100  |
| Maximum Amount     |               |      |        |      |       |      |       |      |
| Up to \$250        | 3             | 15   | 0      | —    | 0     | —    | 3     | 5    |
| Up to \$1,000      | 0             | —    | 1      | 5    | 2     | 12   | 3     | 5    |
| Variable limits    | 6             | 30   | 6      | 34   | 7     | 41   | 19    | 36   |
| No limits set      | 7             | 35   | 8      | 44   | 5     | 29   | 20    | 36   |
| No reply           | 4             | 20   | 3      | 17   | 3     | 18   | 10    | 18   |
| Total              | 20            | 100  | 18     | 100  | 17    | 100  | 55    | 100  |
| Security Required  |               |      |        |      |       |      |       |      |
| Crop lien/chattel  | 3             | 15   | 0      | —    | 2     | 12   | 5     | 17   |
| Varies with person | 5             | 25   | 3      | 17   | 3     | 18   | 11    | 20   |
| None specifically  | 8             | 40   | 11     | 61   | 8     | 46   | 27    | 42   |
| Note receivable    | 0             | —    | 0      | —    | 3     | 18   | 3     | 5    |
| No reply           | 4             | 20   | 4      | 22   | 1     | 6    | 9     | 16   |
| Total              | 20            | 100  | 18     | 100  | 17    | 100  | 55    | 100  |

TABLE 15.—Financial and Operating Ratios, 55 Farm Supply Stores, Louisiana, 1961

| Item                                                          | Size of Store |         |         |         | Average<br>for U.S. |
|---------------------------------------------------------------|---------------|---------|---------|---------|---------------------|
|                                                               | Small         | Medium  | Large   | Total   |                     |
| Fixed assets per employee <sup>a</sup>                        | \$5,379       | \$5,867 | \$7,372 | \$6,482 | \$5,000             |
| Operating expense (Percent of sales)                          | 16.4          | 11.4    | 11.1    | 11.8    | 10.8                |
| Payroll expense (Percent of sales)                            | 9.3           | 5.6     | 5.9     | 6.2     | 5.3                 |
| Working capital per employee <sup>b</sup>                     | 3,450         | 4,071   | 7,111   | 5,707   | 15,000              |
| Rate of turnover (Number) <sup>c</sup>                        | 12.6          | 9.9     | 16.5    | 13.5    | 10.6                |
| Year-end accounts receivable as percentage of sales (Percent) | 7.0           | 9.2     | 7.3     | 7.8     | 5.3                 |
| Net profit as percentage of sales <sup>d</sup>                | -2.7          | 0.9     | 1.0     | 0.5     | 1.5                 |
| Net profit as percentage of net worth (Percent) <sup>e</sup>  | -9.6          | 3.2     | 6.2     | 2.6     | 8.0                 |

<sup>a</sup>Land, buildings and equipment investment ÷ number of employees.

<sup>b</sup>Current assets minus current liabilities ÷ number employed.

<sup>c</sup>Annual sales ÷ year's-end inventory valued at cost.

<sup>d</sup>Total net profit minus value of operators' management.

<sup>e</sup>Net worth is equal to assets minus liabilities.

per employee or too few employees for their fixed assets. The former is probably the case because payroll expense of sales was higher for Louisiana stores than for the national average.

**Operating Expense of Sales**—Louisiana farm supply stores had a higher operating expense of sales compared with the national average. Operating expenses per dollar of sales decreased with size of store (Table 15).

**Payroll Expense of Sales**—Payroll expense of sales was higher for Louisiana stores compared with the national average (Table 15).

**Working Capital Per Employee**—Working capital per employee was much smaller for Louisiana farm supply stores than for the industry average (Table 15).

**Rate of Merchandising Turnover**—Louisiana stores had a better rate of merchandise turnover than the national average. With year's-end inventories at a low point in relation to sales, the turnover rate was higher (Table 15).

**Ending Receivables to Sales**—Louisiana stores had a higher percentage of receivables at year's end to sales than the national average (Table 15).

**Net Profit to Sales**—Net profit\* as a percent of sales ranged from -2.7 for small stores to 0.9 for medium stores and 1.0 for large stores. These ratios were all smaller than the national average of 1.5 (Table 15).

**Net Profit to Net Worth**—Net profit per dollar of net worth was -9.6, 3.2, and 6.2 percent for small, medium, and large stores, respectively (Table 15). This compares with 8 percent as an average for stores in the United States.

Each of these ratios, when compared with national averages, reveals a potential problem. However, the points which need to be made are related to size of store. Small stores do not do the volume of business to justify continuing in business from a profit viewpoint if the manager can earn \$5,000 working for someone else. In fact, this move would be justified at a smaller salary since the net profit was negative after paying such a salary. (This is the average and may not be true for all small stores.) However, if an owner is settled in a community he may be justified in remaining in business due to (1) lower living costs and (2) sociological factors such as advanced age or social satisfaction from running a farm supply store and living in his particular community.

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\*Net profit as used here is total net profit minus an allowance for operators' management. Operators' management was arbitrarily set at \$5,000 for small stores, \$7,500 for medium stores and \$10,000 for large stores. These are estimated salaries of what the managers could have made working for someone else.

## **Problem Areas**

Problems reported by operators of farm supply stores are categorized as follows: (1) trade group relationships, (2) government policy, (3) cooperatives, (4) credit for customers, (5) resource use, and (6) store management.

### **Trade Group Relationships**

The problem of manufacturer-wholesaler-retailer relationships is a significant one. Retail storeowners are keenly aware of the efforts of some manufacturers and wholesalers in by-passing retail stores and selling direct to farmers often at a price below the retailer's price. This by-passing of retailers is not confined to the farm supply store business but is also characteristic of many other retail businesses in the United States.

Store markups on feed, seed, and fertilizer, which constitute the bulk of their business, have been reduced considerably, thus causing unfavorable net returns to retail store operators, especially the smaller ones.

### **Government Farm Policy**

Agricultural policies of the federal government affect farm supply stores in many ways. For example, the Soil Bank program retires land from farming and reduces the number of farmers. Acreage allotment programs reduce acreages but stimulate fertilization on the remaining acres.

At the state government level, a more uniform sales tax policy on supply items was mentioned. At present, feed and seed are exempted but other supplies are not. It was the belief that all farm supplies should be exempted from the state sales tax.

### **Cooperatives**

Many of the retail storeowners are aware of the tax exemption status of some farmers' cooperatives. Also, by using cooperatives, farmers themselves integrate into the farm supply field. Most storeowners would like to see the Congress re-examine the tax status of cooperatives. (This study occurred before the Congress had passed the 1962 Revenue Act dealing with co-op taxation.)

### **Customer Credit**

In the competition for customers, credit is often the main tool used by supply stores. This has brought about unnecessary use of credit by



customers and of unsound credit policies by the stores themselves. The problem of collecting overdue accounts was receiving much attention.

## Resource Use

It was the feeling of many storeowners that agricultural policies of the federal government designed to help the small farmer have failed. Instead, larger farmers have benefitted. They also recognize that some farms are just too small and too uneconomical to provide a satisfactory income regardless of government programs designed to aid these people.

Storeowners felt that rural-urban migration is emphasized too strongly and that, instead, a better rural farm and rural nonfarm program should be emphasized so that part-time jobs in the towns and cities could be combined with limited on-farm pursuits for those farms which are uneconomical or marginal-type operations.

## Store Management

Storeowners recognized that in-store management needed improvement, such as better training of employees in knowledge of their business and of meeting the public, and better bookkeeping methods, where costs could be accurately allocated and items of inventory analyzed relative to their turnover and net profits.

## Research Needs

Additional research is needed to answer some of the following questions relating to retail farm stores:

1. Should the sole proprietor of a retail farm supply store incorporate to advantage, especially in getting more equity capital?
2. Can the farm supply store operator survive if manufacturers continue to by-pass his store and sell direct to farmers? Can the farm supply store operator integrate by feeding more of his own animals?
3. Can linear programming techniques be usefully applied to the farm supply store business, as in computing an optimum product-mix assuming certain labor, capital, and inventory restrictions?
4. What items or services could be added to even out seasonal sales fluctuations?
5. What kind of an employee training program is needed?
6. Can small farm supply stores in Louisiana organize a cooperative wholesale and manufacturing federation in order to lower their costs?

7. What is an optimum size farm supply store in terms of annual sales—\$100,000, \$250,000, or \$500,000?
8. What constitutes a sound credit policy for farm supply stores? Can credit bureaus be of help in eliminating poor credit risks?
9. Can farm supply stores develop workable credit relationships with their customers through production credit association and bank financing?
10. What farm laws, price support programs, and federal loan programs are pertinent or related to farm supply store operations?
11. What kind of modern bookkeeping system could be adapted to retail farm supply stores in order to yield useful statistical, financial, and operating data?

# Appendix

## A. Tables

**APPENDIX TABLE 1.—Ownership and Leasing of Store Facilities, 55 Farm Supply Stores, Louisiana, 1961**

| Item                 | Size of Stores       |        |       |       |
|----------------------|----------------------|--------|-------|-------|
|                      | Small                | Medium | Large | Total |
|                      | Percentage of Stores |        |       |       |
| Land                 |                      |        |       |       |
| Lease                | 40                   | 67     | 35    | 47    |
| Own                  | 60                   | 33     | 65    | 53    |
| Buildings            |                      |        |       |       |
| Lease                | 35                   | 39     | 18    | 31    |
| Own                  | 65                   | 61     | 82    | 69    |
| Office Equipment     |                      |        |       |       |
| Lease                | 0                    | 11     | 0     | 4     |
| Own                  | 100                  | 89     | 100   | 96    |
| Other Equipment      |                      |        |       |       |
| Lease                | 0                    | 6      | 0     | 2     |
| Own                  | 100                  | 94     | 100   | 98    |
| Reasons for Leasing  |                      |        |       |       |
| Railroad property    | 13                   | 33     | 50    | 31    |
| Owner prefers lease  | 25                   | 25     | 33    | 27    |
| Purchase unavailable | 62                   | 42     | 17    | 42    |
| Total                | 100                  | 100    | 100   | 100   |

**APPENDIX TABLE 2.—Number of Parishes Served and Radius of Service Area, 55 Farm Supply Stores, Louisiana, 1961**

| Item                      | Size of Stores         |        |       |       |
|---------------------------|------------------------|--------|-------|-------|
|                           | Small                  | Medium | Large | Total |
|                           | Percentage of Stores   |        |       |       |
| Number of Parishes Served |                        |        |       |       |
| One                       | 20                     | 11     | 18    | 16    |
| Two                       | 30                     | 11     | 12    | 18    |
| Three                     | 35                     | 22     | 12    | 24    |
| Four                      | 5                      | 40     | 35    | 25    |
| Five                      | 10                     | 5      | 18    | 11    |
| Six to ten                | —                      | 5      | 5     | 4     |
| More than ten             | —                      | 6      | 0     | 2     |
| Total                     | 100                    | 100    | 100   | 100   |
|                           | Average Radius (Miles) |        |       |       |
| Service Area              |                        |        |       |       |
| North                     | 14.0                   | 20.0   | 26.0  | 19.7  |
| East                      | 12.5                   | 19.3   | 30.6  | 20.0  |
| South                     | 15.0                   | 26.4   | 32.3  | 24.1  |
| West                      | 13.0                   | 19.0   | 35.2  | 21.8  |
| Average                   | 13.7                   | 21.1   | 31.0  | 21.5  |

**APPENDIX TABLE 3.—Stores Reporting Sales of Various Supply Items, 55 Farm Supply Stores, Louisiana, 1961**

| Supplies                      | Size of Stores |   |   |   |   |                      |  |       |   |       |   |
|-------------------------------|----------------|---|---|---|---|----------------------|--|-------|---|-------|---|
|                               | Small          |   |   |   |   | Medium               |  | Large |   | Total |   |
|                               | —              | — | — | — | — | Percentage of Stores |  | —     | — | —     | — |
| Feed                          | 90             |   |   |   |   | 94                   |  | 100   |   | 95    |   |
| Seed                          | 95             |   |   |   |   | 89                   |  | 100   |   | 95    |   |
| Dry fertilizer                | 80             |   |   |   |   | 89                   |  | 94    |   | 87    |   |
| Liquid fertilizer             | 5              |   |   |   |   | —                    |  | —     |   | 2     |   |
| Chemical                      | 80             |   |   |   |   | 83                   |  | 65    |   | 76    |   |
| Veterinary supplies           | 40             |   |   |   |   | 56                   |  | 59    |   | 50    |   |
| Petroleum                     | 10             |   |   |   |   | 6                    |  | 6     |   | 7     |   |
| Building material             | 5              |   |   |   |   | 22                   |  | —     |   | 9     |   |
| Machinery-equipment           | 10             |   |   |   |   | 17                   |  | 24    |   | 16    |   |
| Hardware                      | 35             |   |   |   |   | 56                   |  | 47    |   | 45    |   |
| Tires, batteries, accessories | —              |   |   |   |   | 6                    |  | —     |   | 2     |   |
| Containers                    | 15             |   |   |   |   | 11                   |  | 12    |   | 13    |   |
| Home-garden                   | 55             |   |   |   |   | 50                   |  | 77    |   | 60    |   |
| Steel                         | 25             |   |   |   |   | 28                   |  | 30    |   | 27    |   |
| Others                        | 35             |   |   |   |   | 22                   |  | 12    |   | 24    |   |
| Total                         | 100            |   |   |   |   | 100                  |  | 100   |   | 100   |   |

**APPENDIX TABLE 4.—Sources of Information Utilized by Management, 55 Farm Supply Stores, Louisiana, 1961**

| Source                          | Size of Stores |   |   |   |   |                      |  |       |   |   | Total |     |
|---------------------------------|----------------|---|---|---|---|----------------------|--|-------|---|---|-------|-----|
|                                 |                |   |   |   |   |                      |  |       |   |   |       |     |
|                                 | Small          |   |   |   |   | Medium               |  | Large |   |   |       |     |
|                                 | —              | — | — | — | — | Percentage of Stores |  | —     | — | — | —     | —   |
| Trade journals                  | 24             |   |   |   |   | 21                   |  | 28    |   |   |       | 25  |
| Government reports              | 24             |   |   |   |   | 15                   |  | 18    |   |   |       | 19  |
| Company literature              | 12             |   |   |   |   | 9                    |  | 2     |   |   |       | 7   |
| County agent, vo-ag teacher     | 12             |   |   |   |   | 21                   |  | 20    |   |   |       | 18  |
| Agri. Experiment Station        | 10             |   |   |   |   | 18                   |  | 20    |   |   |       | 16  |
| None                            | 18             |   |   |   |   | 9                    |  | 5     |   |   |       | 10  |
| Private consultants             | —              |   |   |   |   | 5                    |  | 5     |   |   |       | 3   |
| Chamber of Commerce             | —              |   |   |   |   | 2                    |  | —     |   |   |       | 1   |
| A. S. C. S. office <sup>1</sup> | —              |   |   |   |   | —                    |  | 2     |   |   |       | 1   |
| Total                           | 100            |   |   |   |   | 100                  |  | 100   |   |   |       | 100 |

<sup>1</sup>Agricultural Stabilization and Conservation Service.

**APPENDIX TABLE 5.—Advertising Expenditures, 55 Farm Supply Stores, Louisiana, 1961**

| Percent of Gross Sales<br>Spent on Advertising | Size of Stores       |        |       |     | Total |
|------------------------------------------------|----------------------|--------|-------|-----|-------|
|                                                | Small                | Medium | Large |     |       |
|                                                | Percentage of Stores |        |       |     |       |
| None                                           | 25                   | 22     | 18    | 22  |       |
| Less than 1 percent                            | 50                   | 50     | 24    | 42  |       |
| 1—1.9 per cent                                 | 10                   | 20     | 29    | 20  |       |
| 2—2.9 percent                                  | 10                   | —      | 24    | 11  |       |
| 3 percent and more                             | 5                    | 8      | 5     | 5   |       |
| Total                                          | 100                  | 100    | 100   | 100 |       |



**APPENDIX TABLE 6.—Stores Reporting Consignment Purchases, 55 Farm Supply Stores, Louisiana, 1961**

| Items on Consignment  | Size of Stores   |        |       | Total |
|-----------------------|------------------|--------|-------|-------|
|                       | Small            | Medium | Large |       |
|                       | Number of Stores |        |       |       |
| Dry fertilizer        | 8                | 7      | 6     | 21    |
| Chemicals             | 2                | 2      | 3     | 7     |
| Garden seeds          | 1                | 1      | 2     | 4     |
| Field seeds           | 1                | 0      | 1     | 2     |
| Milking machines      | 0                | 1      | 0     | 1     |
| Total                 | 12               | 11     | 12    | 35    |
| Percent of all stores | 60               | 61     | 71    | 64    |

**APPENDIX TABLE 7.—Credit Loss Experience and Credit Plans, 55 Farm Supply Stores, Louisiana, 1961**

| Item                 | Size of Stores       |        |       | Total |
|----------------------|----------------------|--------|-------|-------|
|                      | Small                | Medium | Large |       |
|                      | Percentage of Stores |        |       |       |
| Loss on Credit Sales |                      |        |       |       |
| Less than 1 percent  | 25                   | 28     | 29    | 27    |
| 1 percent            | 25                   | 22     | 18    | 22    |
| 2 percent            | 10                   | 6      | 29    | 15    |
| 3-5 percent          | 15                   | 11     | 6     | 11    |
| 6-10 percent         | —                    | —      | 12    | 4     |
| Over 10 percent      | 5                    | 5      | —     | 4     |
| Does not apply       | 20                   | 28     | 6     | 17    |
| Total                | 100                  | 100    | 100   | 100   |
| Credit Plans         |                      |        |       |       |
| Will remain same     | 30                   | 39     | 24    | 31    |
| Will expand          | 65                   | 44     | 70    | 60    |
| Does not apply       | 5                    | 17     | 6     | 9     |
| Total                | 100                  | 100    | 100   | 100   |
| Use Credit Bureaus   |                      |        |       |       |
| Yes                  | 20                   | 22     | 29    | 24    |
| No                   | 80                   | 78     | 71    | 76    |
| Total                | 100                  | 100    | 100   | 100   |

**APPENDIX TABLE 8.—Reasons for Non-Payment of Credit Accounts, 55 Farm Supply Stores, Louisiana, 1961**

| Reasons                                                      | Number of Stores Reporting <sup>a</sup> |
|--------------------------------------------------------------|-----------------------------------------|
| Poor risk, credit rating not investigated                    | 6                                       |
| Customer blames dealer when operations are unprofitable      | 2                                       |
| Acts of God                                                  | 1                                       |
| No sound credit policy                                       | 1                                       |
| Customers use store credit but pay off other creditors first | 4                                       |
| Customers leaving area                                       | 1                                       |
| Bankruptcies and bad checks                                  | 2                                       |
| Customers over-extended on credit                            | 3                                       |

<sup>a</sup>From sample of 55 stores surveyed.

## B. Questionnaire

Date \_\_\_\_\_ Enumerator \_\_\_\_\_

Louisiana Agricultural Experiment Station  
Department of Agricultural Business  
Baton Rouge, Louisiana

Name of Store \_\_\_\_\_ Mail Address \_\_\_\_\_

Business Address \_\_\_\_\_ Person Inter./Title \_\_\_\_\_

Year store started \_\_\_\_\_

### I. LEGAL AND ECONOMIC ASPECTS OF OWNERSHIP

1. (a) Type of ownership: (check)

Single proprietorship  
Partnership  
Corporation  
Other

Originally

Now

- (b) If type of ownership differs now from original, why was it changed: (check)

|                                |                                 |
|--------------------------------|---------------------------------|
| 1. Need for more capital _____ | 5. Family considerations _____  |
| 2. Personnel changes _____     | 6. Management got complex _____ |
| 3. For tax benefits _____      | 7. _____                        |
| 4. To reduce liability _____   | 8. _____                        |

- (c) Are you planning to change the type of legal ownership presently or later?  
Yes \_\_\_\_\_ No \_\_\_\_\_. If yes, why \_\_\_\_\_

2. (a) Do you lease or own the following? (Ownership does not require full equity):  
(check)

|                  | Lease | Own   | Reason for Leasing |
|------------------|-------|-------|--------------------|
| Land             | _____ | _____ | _____              |
| Buildings        | _____ | _____ | _____              |
| Office equipment | _____ | _____ | _____              |
| Other equipment  | _____ | _____ | _____              |

(Lack of capital, obsolescence and depreciation high, purchase unavailable, better alternative use of money).

3. Please diagram your business organization.

### II. PHYSICAL CHARACTERISTICS OF FIRMS

1. What changes would you make in your facility if you were building it again?  
(Explain)

(a) Location of store: \_\_\_\_\_  
(b) Transportation arrangements into store: \_\_\_\_\_  
(c) Storage facilities: \_\_\_\_\_  
(d) Size of store: \_\_\_\_\_  
(e) Building materials used: \_\_\_\_\_  
(f) Safety devices: \_\_\_\_\_  
(g) Arrangement of store: \_\_\_\_\_  
(h) Equipment type and layout: \_\_\_\_\_  
(i) Design and construction of building: \_\_\_\_\_  
(j) Other(s): \_\_\_\_\_

2. Do you plan to make any major changes in the next 3 years?

Yes \_\_\_\_\_ No \_\_\_\_\_. Explain, whether yes or no: \_\_\_\_\_

3. Diagram your store layout and location, please.

### III. GROWTH

- (a) How many parishes are in your agricultural service area?  
(Specify number now \_\_\_\_\_ and 10 years ago \_\_\_\_\_).
  - (b) Give some reasons for past (expansion) or (contraction) of your service area?  
(Population, types of farming, mechanization, larger farmers) \_\_\_\_\_
  - Approximate size of your service area in terms of miles:  
North \_\_\_\_\_ East \_\_\_\_\_ South \_\_\_\_\_ West \_\_\_\_\_.
  - Volume of sales (Record actual figures if available). (Check each year).
- |                     | 1950  | 1955  | 1960  |
|---------------------|-------|-------|-------|
| Under 100,000       | _____ | _____ | _____ |
| \$100,001-\$250,000 | _____ | _____ | _____ |
| 250,001- 500,000    | _____ | _____ | _____ |
| 500,001-or over     | _____ | _____ | _____ |
| Actual figures (\$) | _____ | _____ | _____ |
- Indicate for 1960 sales only, the approximate breakdown by item sold of farm supply?
    - Feeds \$ \_\_\_\_\_;
    - Seeds \$ \_\_\_\_\_;
    - Dry fertilizers \$ \_\_\_\_\_;
    - Liquid fertilizers \$ \_\_\_\_\_;
    - Chemicals \$ \_\_\_\_\_;
    - Veterinary supplies \$ \_\_\_\_\_;
    - Petroleum products \$ \_\_\_\_\_;
    - Building material \$ \_\_\_\_\_;
    - Mach. equip. \$ \_\_\_\_\_;
    - Hardware \$ \_\_\_\_\_;
    - T.B.A. \$ \_\_\_\_\_;
    - Containers \$ \_\_\_\_\_;
    - Home-garden supply \$ \_\_\_\_\_;
    - Steel products \$ \_\_\_\_\_;
    - Other \$ \_\_\_\_\_.

### IV. SEASONALITY OF BUSINESS

- What is the percentage of business done during the following periods?
 

|                 | Percent of Sales | Percent of Purchases |
|-----------------|------------------|----------------------|
| Jan. 1-March 31 | _____            | _____                |
| Apr. 1-June 30  | _____            | _____                |
| July 1-Sept. 30 | _____            | _____                |
| Oct. 1-Dec. 31  | _____            | _____                |
- (a) What have you done in the recent past or plan to do to smooth out fluctuations in either sales or purchases? \_\_\_\_\_
- Have you considered doing any of these to smooth-out fluctuations? (a) Custom-mix \_\_\_\_\_; (b) Mobile feed mix \_\_\_\_\_; (c) Soil testing \_\_\_\_\_; (d) Concen-grain mix \_\_\_\_\_; (e) Seed cleaning \_\_\_\_\_; (f) Nursery \_\_\_\_\_; (g) Home-garden pkg. \_\_\_\_\_; (h) Liming services \_\_\_\_\_; (i) Other \_\_\_\_\_.

### V. MANAGEMENT

- Is firm management separate from firm ownership? Yes \_\_\_\_\_ No \_\_\_\_\_.  
If yes, what type of decisions do store owners have to approve for store operators? (Specify) \_\_\_\_\_
- Does the store management operate on any incentive plans? Yes \_\_\_\_\_ No \_\_\_\_\_.  
If yes, describe: \_\_\_\_\_
- What sources of economic information do you use for guidance and planning purposes? (Trade journals, government reports, Experiment Station publications)  
Specify: \_\_\_\_\_
- Diagram your "management" structure in Chart III. \_\_\_\_\_

### VI. EMPLOYMENT AND LABOR

- What fringe benefits or incentive plans are offered to nonmanagement personnel or hourly/wage earners in your firm? (Insurance plans and hospitalization, pension plans, commissions, bonuses, company cars, free prizes, vacations, perquisites, education, salary raises, promotions). \_\_\_\_\_

2. Do you have any specific incentive plans for your nonmanagement employees?  
Yes\_\_\_\_\_ No\_\_\_\_\_. If yes, describe: \_\_\_\_\_
3. Number of labor and management personnel. (1 man unit = 40 hours weekly).  

| Type                    | Spring Season (1961) |        | Winter Season (1960-61) |        |
|-------------------------|----------------------|--------|-------------------------|--------|
|                         | Male                 | Female | Male                    | Female |
| Executive (Owner-mngr.) | _____                | _____  | _____                   | _____  |
| Clerical office work    | _____                | _____  | _____                   | _____  |
| Sales work              | _____                | _____  | _____                   | _____  |
| Fieldmen                | _____                | _____  | _____                   | _____  |
| Trucking                | _____                | _____  | _____                   | _____  |
| Warehousing             | _____                | _____  | _____                   | _____  |
| Servicing/Repairing     | _____                | _____  | _____                   | _____  |
| Total                   | _____                | _____  | _____                   | _____  |
4. Of the total number of personnel, what was the turnover last year (Number leaving ÷ Number employed)? \_\_\_\_\_
5. What are some of your problems regarding your hired employed? \_\_\_\_\_

## VII. PURCHASING

1. Can you indicate your purchasing arrangements for the following?

|                   | (a)              | (b)                   | (c)                | (d)      |
|-------------------|------------------|-----------------------|--------------------|----------|
| Item              | No. of Suppliers | Location of Suppliers | Franchise Arrgmts. | Problems |
| Feed              | _____            | _____                 | _____              | _____    |
| Seed              | _____            | _____                 | _____              | _____    |
| Dry fertilizer    | _____            | _____                 | _____              | _____    |
| Liquid fertilizer | _____            | _____                 | _____              | _____    |
| Chemicals         | _____            | _____                 | _____              | _____    |
| Vet. supplies     | _____            | _____                 | _____              | _____    |
| Petroleum         | _____            | _____                 | _____              | _____    |

|                   | (a)              | (b)                   | (c)                | (d)      |
|-------------------|------------------|-----------------------|--------------------|----------|
| Item              | No. of Suppliers | Location of Suppliers | Franchise Arrgmts. | Problems |
| Oils, grs.        | _____            | _____                 | _____              | _____    |
| T.B.A.            | _____            | _____                 | _____              | _____    |
| Lime              | _____            | _____                 | _____              | _____    |
| Bldg. materials   | _____            | _____                 | _____              | _____    |
| Containers        | _____            | _____                 | _____              | _____    |
| Mach.-equip.      | _____            | _____                 | _____              | _____    |
| Hdwe. home-garden | _____            | _____                 | _____              | _____    |
| Other             | _____            | _____                 | _____              | _____    |

2. Are manufacturers by-passing you and going direct to farmers?  
Yes\_\_\_\_\_ No\_\_\_\_\_. If yes, describe: \_\_\_\_\_

## VIII. SALES

1. Indicate the proportion of sales and percent of goods delivered to/through the following outlets:

|                         | Percentage of Sales | Percent Delivered to Each: |
|-------------------------|---------------------|----------------------------|
| (a) Direct to:          |                     |                            |
| Farmer/producer         | _____               | _____                      |
| Other retailers         | _____               | _____                      |
| City users              | _____               | _____                      |
| Store owned farm/flocks | _____               | _____                      |
| Other                   | _____               | _____                      |

2. Of the amounts delivered, what percent is done in, (a) your own trucks \_\_\_\_\_%; (b) leased trucks \_\_\_\_\_%; (c) contract haulers \_\_\_\_\_%; (d) Other \_\_\_\_\_%



3. Are you affected by: (a) On-farm feed mixing \_\_\_\_\_, (b) mobile feed \_\_\_\_\_, (c) bulk feeding \_\_\_\_\_, (d) other \_\_\_\_\_.
4. As a feed store, do you plan to feed animals commercially? \_\_\_\_\_.
5. Do you give discounts for: (a) Cash purchases: Yes \_\_\_\_\_ No \_\_\_\_\_.  
If yes, amounts: \_\_\_\_\_; (b) discounts on volume buying: Yes \_\_\_\_\_ No \_\_\_\_\_.  
If yes, amounts: \_\_\_\_\_; (c) discounts for store pickup: Yes \_\_\_\_\_ No \_\_\_\_\_.  
If yes, amounts: \_\_\_\_\_.

#### IX. COMPETITION

1. (a) Are new firms discouraged from entry? eYs \_\_\_\_\_ No \_\_\_\_\_. If so, how? (Control over availability of supplies, control over outlets, legal barriers, profit potentials, capital requirements). \_\_\_\_\_
2. How many competing firms in your area of 25 miles now \_\_\_\_\_.  
Five years ago \_\_\_\_\_.
3. In your area, what are the usual gross markups on supplies handled (% based on selling price or cost)?  
(a) Feed \_\_\_\_\_%; (b) Dry fertilizer \_\_\_\_\_%; (c) Liquid fertilizer \_\_\_\_\_%;  
(d) Hardware \_\_\_\_\_%; (e) Building materials \_\_\_\_\_%; (f) T.B.A. \_\_\_\_\_%;  
(g) Steel products \_\_\_\_\_%; (h) Seeds \_\_\_\_\_%; (i) Chemicals \_\_\_\_\_%;  
(j) Veterinary supplies \_\_\_\_\_%.
4. What percent of your gross annual sales is allocated to advertising? \_\_\_\_\_ percent. (Excluding checkoffs, mandatory deductions).
5. (a) Do you think farmers place higher emphasis on brand name or on price? \_\_\_\_\_  
\_\_\_\_\_
- (b) Express this difference in dollars and cents? \$ \_\_\_\_\_

#### X. CAPITAL: STORE FIRM

1. (a) What is the present resale value of your: Land and buildings \$ \_\_\_\_\_, Office and all other equipment \$ \_\_\_\_\_, Average inventory \$ \_\_\_\_\_.  
(b) How much capital would it take now for you to enter the farm supply business on an average scale? \$ \_\_\_\_\_.
2. What is the source(s) of your short-term capital? \_\_\_\_\_  
(Trade credit, bank loan, notes payable).
3. Do you have any problems in obtaining short-term capital (one year and less)?  
(a) enough capital available \_\_\_\_\_; (b) security usually required: (Specify) \_\_\_\_\_;  
(c) interest rates (Specify) \_\_\_\_\_; (d) repayment terms (Specify) \_\_\_\_\_;  
(e) length of loan (Specify) \_\_\_\_\_.
4. Sources of new long-term loans (over one year): (bank, SBA, sale of stock, bonds, insurance co.). \_\_\_\_\_
5. Do you have any problems in obtaining new long-term loans (Over one year)?  
(a) enough capital available \_\_\_\_\_; (b) security usually required: (Specify) \_\_\_\_\_;  
(c) interest rates (Specify) \_\_\_\_\_; (d) repayment terms (Specify) \_\_\_\_\_;  
(e) length of loan (Specify) \_\_\_\_\_.

#### XI. CUSTOMER CREDIT

1. (a) Do you extend credit to your customers for over 30-days? Yes \_\_\_\_\_ No \_\_\_\_\_.  
(b) If yes, what percent of your sales are on credit? \_\_\_\_\_  
Related to any specific type of merchandise? Yes \_\_\_\_\_ No \_\_\_\_\_.  
If yes, specify: \_\_\_\_\_ Feed \_\_\_\_\_ Fertilizer \_\_\_\_\_ Other(s) \_\_\_\_\_
2. Explain your customer credit terms and/or credit policy. (interest rate, repayment terms, maximum amount, security) \_\_\_\_\_
3. What has been bad debt loss on credit sales? \_\_\_\_\_ %.
4. Do you anticipate: Quitting credit extension \_\_\_\_\_. Further credit extension \_\_\_\_\_. Other plans \_\_\_\_\_.

5. What are some of your other credit problems? \_\_\_\_\_  
6. Do you use credit bureaus, etc., to check on client's credit status?  
Yes\_\_\_\_\_ No\_\_\_\_\_.

## XII. OPERATING RATIOS

1. So that we can compute certain ratios will you furnish the following information: (Confidential).  
(a) Payroll expenses (includes everybody) \$ \_\_\_\_\_  
(b) All other operating expenses \$ \_\_\_\_\_  
(c) Year-end accounts receivable \$ \_\_\_\_\_  
(d) Percent markup to break even with your present volume \_\_\_\_\_ %  
(e) Dollar volume needed to break even with your present markup \$ \_\_\_\_\_  
(f) Average working capital. (Current liabilities from current assets) \$ \_\_\_\_\_  
(g) Net profit \$ \_\_\_\_\_  
(h) Net worth \$ \_\_\_\_\_  
(i) Gross sales for last fiscal year \$ \_\_\_\_\_  
(j) Year-end inventory \$ \_\_\_\_\_
2. Do you try to allocate costs to specific items or department of supplies?  
Yes\_\_\_\_\_ No\_\_\_\_\_.
3. How do you figure when and if to add or drop lines of merchandise? \_\_\_\_\_
4. Have you changed the number of items sold in the last 10 years? Yes \_\_\_\_\_  
No \_\_\_\_\_; Increase \_\_\_\_\_ Decrease \_\_\_\_\_. Have you dropped or added lines of merchandise in the last 10 years? (Specify) \_\_\_\_\_
5. Comments/Impressions. \_\_\_\_\_

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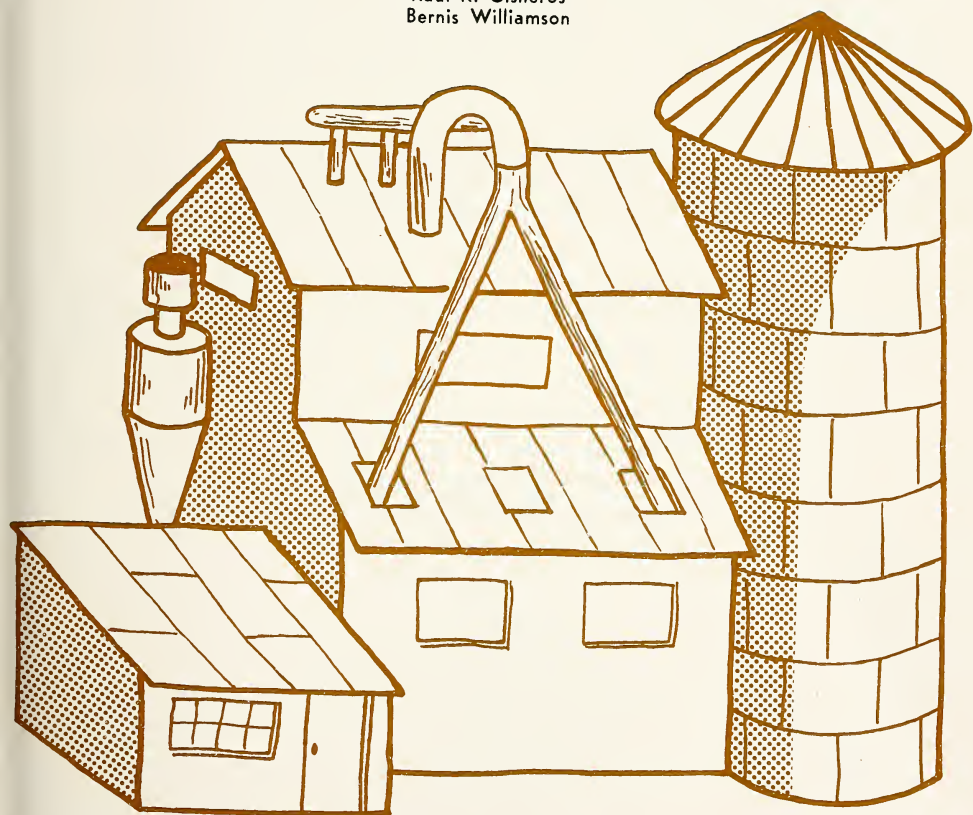






# ECONOMIC PROBLEMS OF SMALL FEED MILLS IN LOUISIANA

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In Cooperation With  
The Small Business Administration  
Washington, D. C.

## Foreword

This study of the feed mill business in Louisiana is one of five agribusiness studies contributing to a project under the general title, "An Economic Analysis of Problems Affecting the Success of Selected Small Agricultural Businesses in Louisiana." The other four phases are concerned with:

1. Feed, seed, and fertilizer supply stores.
2. Local grain elevators.
3. Retail farm equipment stores.
4. Local agricultural canning, packing, and processing plants.

These agribusinesses have problems peculiar to their close relationship to agriculture and, although they perform a very important service to farmers and the community, they have been relatively neglected in terms of economic research.

These studies are intended to provide a first look at these important agriculturally oriented small businesses in the state and to specifically recognize the incidence, magnitude, and nature of problems which confront them.

This research project was conducted by the Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, Louisiana State University, and financed in part by the Small Business Administration, Washington, D.C.

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# Economic Problems of Small Feed Mills In Louisiana

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# Economic Problems of Small Feed Mills In Louisiana

BY JAMES F. HUDSON, RAUL R. CISNEROS  
AND BERNIS WILLIAMSON

## Introduction

Agribusiness plays an important part in the economy of the state of Louisiana (Table I). Agribusinesses provide employment to thousands of persons, purchase great quantities of supplies, and pay management and stockholders from earnings based on Louisiana agriculture.

An agribusiness study entitled "An Economic Analysis of Problems Affecting the Success of Selected Small Agricultural Businesses in Louisiana" has been initiated by the Louisiana Agricultural Experiment Station. The broad objectives of the study are to determine the types of problems faced by agriculturally oriented businesses, to determine their incidence and relative importance, to suggest solutions where possible, and to identify areas in which additional research is needed.

This study of feed mills represents one phase of the overall agribusiness study. For purposes of this study a *feed mill* is defined as the physical equipment for grinding grain and mixing it with concentrates, minerals, and vitamins to be fed to livestock. When a feed mill is organized and operated by management, it is a firm or enterprise. The aggregate of such firms or enterprises comprises the feed mill industry.

Feed is ground not because it increases the nutritive value of the feed, but because it improves the palatability and digestibility of the feed. Also, it is possible to add minerals and vitamins evenly to the ground feed. The efficiency of feed depends upon how well the ingredients of a feed are mixed and ground. Feed mills which offer well ground and mixed feeds that are properly balanced provide a real service to the farmer.

The feed mill industry in the United States is changing. The decreasing number of farms, increasing size of farms, growth of bulk delivery of feed, the trend toward integration of the feed industry and livestock production, and the growth of on-farm and custom feed mixing have all contributed to this change.

The main end-products of the feed industry are meat, milk and eggs. The population increase in the United States, which has increased the consumption of these end-products, is a vital factor in the development and expansion of the feed industry as well as the livestock industry. Much of this expansion is occurring in the South, an area which offers

**TABLE 1.—Estimated Investment of Some Agribusiness Firms in Louisiana, 1959**

| Type firm                                                                | Investment         |
|--------------------------------------------------------------------------|--------------------|
|                                                                          | Dollars            |
| Raw sugar and syrup mills                                                | 51,000,000         |
| Livestock auctions and other markets, major slaughter and packing houses | 13,000,000         |
| Cotton gins, warehouses and compresses                                   | 58,500,000         |
| Oil mills                                                                | 12,000,000         |
| Canning plants                                                           | 5,000,000          |
| Rice mills                                                               | 24,000,000         |
| Grain elevators                                                          | 21,000,000         |
| Rice driers, rice and grain warehouses                                   | 31,000,000         |
| Feed mills                                                               | 10,000,000         |
| Milk product plants                                                      | 36,000,000         |
| Poultry processing plants                                                | 1,500,000          |
| Lumber mills                                                             | 50,000,000         |
| <b>Total</b>                                                             | <b>313,000,000</b> |

Source: *Agriculture: Leading, Serving, Unfolding*. L.S.U. Centennial Publication, 1960.

suitable and favorable conditions for the future development of the feed mill industry.

### Potential Demand for Feed

The market for mixed grain-feeds in Louisiana is growing as more farmers increase their production of livestock and adopt better feeding practices.

Louisiana has increased the production of cattle and calves considerably during the past 30 years.<sup>1</sup> The average number of head of cattle on farms in Louisiana increased from 886,000 during the 1930-34 period to 1,830,000 during the 1956-60 period. The number of milk cows increased from 224,000 in 1930 to 232,000 in 1959 and annual average milk production per cow has increased steadily.

Hogs, sheep, and lambs have all decreased in numbers in recent years in Louisiana. The number of hens has also decreased. However, average annual egg production has increased.

Production of commercial broilers has been rising continuously, especially since 1950, in both number and pounds. Production in 1959 was 69.3 million pounds compared with an annual average broiler production of 53 million pounds for the period 1955-1959 and less than 1 million pounds for the period 1934-1939.

The above data reflect the upward trend in most livestock and livestock by-products in Louisiana and indicate the growing importance of feed mills in the state if these trends continue in the future.

<sup>1</sup>Leo Polopolus, *Louisiana Agriculture: Economic Trends and the Current Status*, Louisiana Agricultural Experiment Station Bulletin Number 550, January, 1962.



## **Objectives**

The specific objectives of this study are: (1) to obtain a clearer picture of the feed mill industry in Louisiana by describing the properties and characteristics of the industry, (2) to define, or point out, feed mill problems, and, where possible, to suggest solutions, and (3) to identify areas requiring additional research.

## **Scope, Methodology, and Sample Size**

The data for this study were obtained from a sample of feed mills located in Louisiana. Basic information needed for this research was obtained by personal interview and, where possible, from feed mill record books.

During the fall of 1960 a questionnaire was mailed to all feed mills in the state (Appendix A). This was done to verify their location and also to determine if these firms were currently in operation. Data from the mailed questionnaires were further used in determining the sample size to be used for the more detailed study which followed.

A personal interview questionnaire was devised and field tested in the spring of 1961 (Appendix B). The questionnaire was designed to obtain quantitative and qualitative data that could be used to meet the objectives of this study.

Data were collected from mill managers, who in most cases were the mill owners or major stockholders. Although most of the sample mills were small mills doing custom work, a wide range of sizes was included in the sample. The largest mill had a volume of business 50 times greater than the smallest mill. Most of the sample mills were corporate or individually owned types of business organizations.

Due to the descriptive nature of the study, a simple statistical analysis was made of the data. The mean or arithmetical average was used frequently throughout the study.

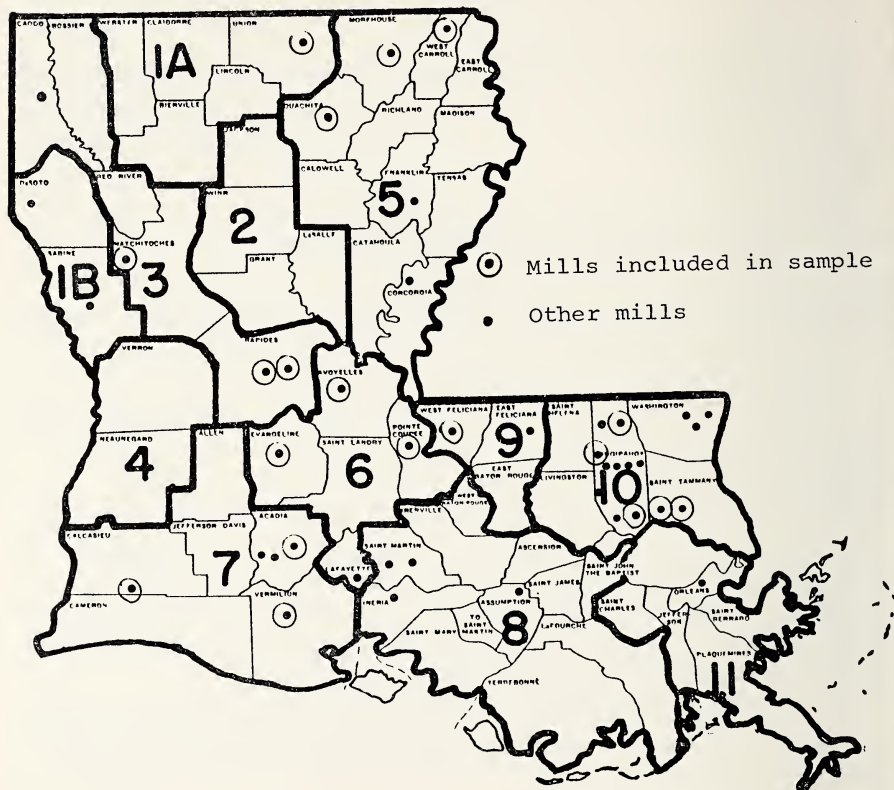
## **Selection of Sample for Personal Interview**

Replacement value and gross volume of business as reported on the mail questionnaires were used to determine sample size for the more detailed personal interviews. Based on the two characteristics mentioned above, it was determined that a sample size of 19 would be representative. This sample size is equivalent to a random sample of 44 percent of the population. The locations of the feed mills used in the study are shown in Figure 1.

# The Louisiana Feed Mill Industry

The information presented in this section was obtained by the use of (1) a mail questionnaire and (2) a personal interview questionnaire.

**FIGURE 1.—Location of Feed Mills and Mills Included in the Study, by Parishes and Types of Farming Areas, Louisiana, 1960.**



## Type of Farming Areas

- 1A Upland Louisiana Timber Area
- 1B Northwest Louisiana Hill Area
- 2 North Central Louisiana Cutover Pine Area
- 3 Red River Cotton Area
- 4 Cutover Flatwoods Area
- 5 Mississippi Delta Area
- 6 Central Louisiana Mixed Farming Area
- 7 Louisiana Rice Area
- 8 Louisiana Sugar Cane Area
- 9 Southeast Mixed Farming Area
- 10 Louisiana Dairy, Poultry, and Truck Area
- 11 New Orleans Truck and Fruit Area

## Mail Questionnaire Data

The mail questionnaire, in addition to being used for obtaining general information pertaining to Louisiana feed mills, was also used to verify the existence of feed mills operating in the state during 1960. Responses were obtained from 95 percent of the feed mills to which the questionnaires were mailed.

During 1960 there were 43 feed mills operating in Louisiana (Figure 1). The majority of the feed mills, 35 percent, were located in Area 10, the Louisiana dairy, poultry and truck area. Next in importance were areas 5 and 7 which account for the largest relative share of Louisiana's cattle and calves. Tangipahoa Parish<sup>2</sup> in area 10 had the largest number of feed mills of any parish in the state. Twenty-five percent of the feed mills were located in that parish.

Analysis of the mail questionnaire indicated that almost half of the firms in the industry were corporations. Approximately 38 percent of the firms were single proprietorships (Table 2).

The single plant type of physical organization accounted for 96 percent of the feed mills in the state. This indicates that a separate management for each firm or unit existed for most of the feed mills in Louisiana (Table 2).

The average replacement value<sup>3</sup> per firm was \$90,000 (Table 2). A further breakdown of replacement value is shown in Table 3. The

<sup>2</sup>A "parish" is equivalent to a "county" in other states.

<sup>3</sup>"Replacement value" is the present value of land, buildings, equipment and fixtures. It does not include inventory of salable goods.

TABLE 2.—General Description of 43 Feed Mills, Louisiana, 1960

| Description                            |         | Number or amount    |
|----------------------------------------|---------|---------------------|
| Type of legal organization:            |         |                     |
| Single proprietorship                  | Number  | 15                  |
| Partnership                            | Number  | 6                   |
| Corporation                            | Number  | 20                  |
| Cooperative                            | Number  | 0                   |
| Other                                  | Number  | 2 <sup>1</sup>      |
| Average radius of principal trade area | Miles   | 30                  |
| Average replacement value              | Dollars | 90,000 <sup>2</sup> |
| Type of physical organization:         |         |                     |
| Single plant                           | Number  | 41                  |
| Part of national chain                 | Number  | 1                   |
| One of two or more in the state        | Number  | 1                   |
| Average years in operation             | Number  | 13                  |

<sup>1</sup>Includes a joint venture firm and one unknown.

<sup>2</sup>Replacement value does not include inventory of salable goods.

mean replacement value was \$90,000, the median was \$60,000, and the modal class was between \$41,000 and \$50,000. Twenty-three, or 54 percent, of the feed mills had replacement values of less than \$60,000. This points out the existence of a large number of small economic units in the Louisiana feed mill industry.

Feed mills in the state had been in business an average of 13 years. However, the greatest growth in number of firms occurred during the 1950-1954 period. The largest number of new firms was established in 1952. Eighty-one percent of the mills that answered the mailed questionnaire started business after 1945 (Figure 2). In other words, the growth of the Louisiana feed mill industry has been primarily a post World War II development. The high prices for these end-products of the feed industry after World War II created an increase in demand for feed. This increase in demand for feed motivated the establishment of many feed mills throughout the state and the United States during this period.

Table 4 shows the number of farms, farm income, and number of feed mills by farming areas in Louisiana. From a feed consumption standpoint, area 10 was the most important area in the state. This was due to high poultry and milk production in the area and the resulting demand for feed. Areas 7 and 8 are increasing in importance due to the increasing complementary production of livestock with the main crops of these

**TABLE 3.—Frequency Distribution of Replacement Values, 43 Feed Mills, Louisiana, 1960**

| Replacement value class | Number of firms |
|-------------------------|-----------------|
| Dollars                 | Number          |
| 10,000 - 20,000         | 4               |
| 21,000 - 30,000         | 6               |
| 31,000 - 40,000         | 3               |
| 41,000 - 50,000         | 8               |
| 51,000 - 60,000         | 2               |
| 61,000 - 70,000         | -               |
| 71,000 - 80,000         | 3               |
| 81,000 - 90,000         | 1               |
| 91,000 -100,000         | 2               |
| 101,000 -110,000        | -               |
| 111,000 -120,000        | -               |
| 121,000 -130,000        | -               |
| 131,000 -140,000        | -               |
| 141,000 -150,000        | 5               |
| 151,000 -160,000        | -               |
| 161,000 -170,000        | 1               |
| 171,000 -180,000        | 1               |
| Over 180,000            | 6               |
| Unknown                 | 1               |
| Total                   | 43              |



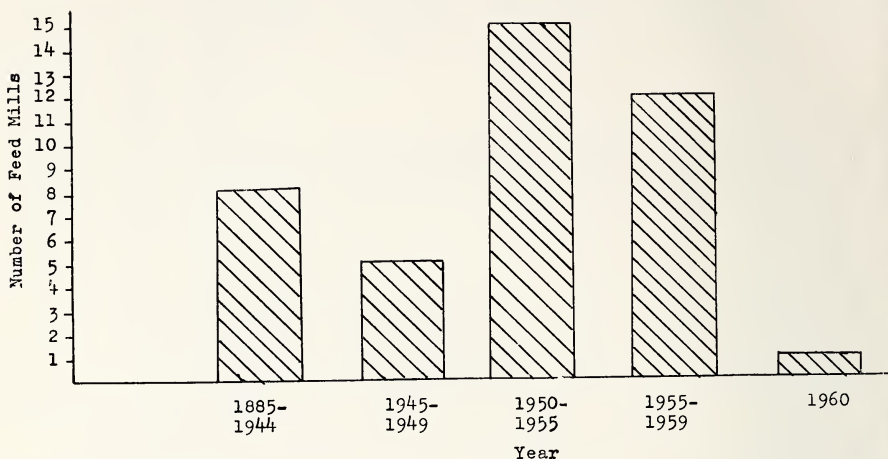
TABLE 4.—Number of Farms, Farm Income, and Number of Feed Mills by Farming Areas, Louisiana, 1960

| Farming area                                | Feed mills | Farms  | Number of farms per mill | Gross farm income per farming area | Average gross income per farm | Gross farm income available per feed mill |
|---------------------------------------------|------------|--------|--------------------------|------------------------------------|-------------------------------|-------------------------------------------|
|                                             |            | Number |                          |                                    | Dollars                       |                                           |
| 1A Upland Louisiana Timber Area             | 1          | 5,449  | 5,449                    | 9,817,000                          | 1,802                         | 9,817,000                                 |
| 1B Northwest Louisiana Hill Area            | 2          | 3,007  | 1,503                    | 5,446,000                          | 1,818                         | 2,733,000                                 |
| 2 North Central Louisiana Cutover Pine Area | —          | 2,792  | —                        | 3,452,000                          | 1,236                         | —                                         |
| 3 Red River Cotton Area                     | 4          | 7,637  | 1,909                    | 37,325,000                         | 4,887                         | 9,441,250                                 |
| 4 Cutover Flatwoods Area                    | —          | 2,443  | —                        | 3,165,000                          | 1,296                         | —                                         |
| 5 Mississippi Delta Area                    | 5          | 13,199 | 2,640                    | 73,000,000                         | 5,531                         | 14,600,000                                |
| 6 Central Louisiana Mixed Farming Area      | 4          | 14,404 | 3,601                    | 59,262,000                         | 4,114                         | 14,815,500                                |
| 7 Louisiana Rice Area                       | 5          | 7,836  | 1,567                    | 79,784,000                         | 10,182                        | 15,956,800                                |
| 8 Louisiana Sugar Cane Area                 | 4          | 5,882  | 1,470                    | 51,206,000                         | 8,706                         | 12,801,000                                |
| 9 Southeast Mixed Farming Area              | 2          | 2,498  | 1,249                    | 7,587,000                          | 3,037                         | 3,793,500                                 |
| 10 Louisiana Dairy, Poultry and Truck Area  | 15         | 8,521  | 568                      | 25,209,000                         | 2,958                         | 1,680,600                                 |
| 11 New Orleans Truck and Fruit Area         | 1          | 770    | 770                      | 4,279,000                          | 5,557                         | 4,279,000                                 |
| State total                                 | 43         | 74,438 |                          | 359,552,000                        | 4,830                         |                                           |

Source: (a) J. P. Montgomery, *Estimates of the Annual Cash Income from Farm Marketings, by Parishes, Louisiana, 1929, 1939, and 1943-1958*, DAE Cir. 240, Baton Rouge: Louisiana Agricultural Experiment Station, 1959, p. 1.

(b) L. L. Fielder, Jr., *Trends in Farm Land Acreage, Use, and Value in Louisiana, 1909-1959*, DAE Cir. 279, Baton Rouge: Louisiana Agricultural Experiment Station, 1961, p. 8.

**FIGURE 2.— Feed Mills Classified as to Time of Entry into the Business, Louisiana, 1885-1960.<sup>1</sup>**



<sup>1</sup>Forty-one feed mills reporting.

areas. These areas will play an important part in the future of the feed mill industry.

The average radius of the principal trade area for Louisiana feed mills was 30 miles. The radius of the service area ranged from 8 to 185 miles. The average size of feed mill service area by type of farming area is shown in Table 5. The two largest service areas were in areas 7 and 8. The service area for area 10 was less than one-third the size of the service area radius of areas 7 and 8. There were more farms in area 10 than in area 7 or 8. This may account for some of the difference in radius of service area sizes

**TABLE 5.—Average Size of Service Area by Farming Areas, 43 Feed Mills, Louisiana, 1960**

| Farming area                                | Feed mills | Average radius of service area |
|---------------------------------------------|------------|--------------------------------|
|                                             | Number     | Miles                          |
| 1A Upland Louisiana Timber Area             | 1          | 15                             |
| 1B Northwest Louisiana Hill Area            | 2          | 20                             |
| 2 North Central Louisiana Cutover Pine Area | 0          | —                              |
| 3 Red River Cotton Area                     | 4          | 41                             |
| 4 Cutover Flatwoods Area                    | 0          | —                              |
| 5 Mississippi Delta Area                    | 5          | 25                             |
| 6 Central Louisiana Mixed Farming Area      | 4          | 16                             |
| 7 Louisiana Rice Area                       | 5          | 64                             |
| 8 Louisiana Sugar Cane Area                 | 4          | 52                             |
| 9 Southeast Mixed Farming Area              | 2          | 15                             |
| 10 Louisiana Dairy, Poultry and Truck Area  | 15         | 19                             |
| 11 New Orleans Truck and Fruit Area         | 1          | 14                             |

**TABLE 6.—Size of Service Area by Year Firm Started Business, 40 Feed Mills, Louisiana, 1960**

| Year started business | Feed mills | Average radius of service area |
|-----------------------|------------|--------------------------------|
|                       | Number     | Miles                          |
| 1885-1914             | 2          | 78                             |
| 1915-1934             | 4          | 70                             |
| 1935-1944             | 2          | 32                             |
| 1945-1949             | 5          | 19                             |
| 1950-1954             | 15         | 25                             |
| 1955-1959             | 11         | 30                             |
| 1960                  | 1          | 25                             |
| Total                 | 40         | Average 30                     |

**TABLE 7.—Classified Employees of 39 Feed Mills, Louisiana, 1960**

| Type employee | Permanent |        | Seasonal |        | Total |
|---------------|-----------|--------|----------|--------|-------|
|               | Male      | Female | Male     | Female |       |
|               | Number    |        |          |        |       |
| Manager       | 39        | 0      | 0        | 0      | 39    |
| Office worker | 20        | 29     | 0        | 2      | 51    |
| Laborer       | 297       | 0      | 43       | 0      | 340   |
| Salesman      | 31        | 0      | 0        | 0      | 31    |
| Serviceman    | 19        | 0      | 0        | 0      | 19    |
| Supervisor    | 14        | 0      | 0        | 0      | 14    |
| Other         | 18        | 1      | 0        | 0      | 19    |
| Total         | 438       | 30     | 43       | 2      | 513   |

Table 6 compares the size of service area by the number of years that a firm has been in business. It was thought that the older the mill, the larger its service area. Although this was true for firms starting in business prior to 1934, the table shows that most mills established since that time do not have this direct relationship.

Feed mills in the state paid out approximately \$2,000,000 in salaries during 1960. Thirty-nine feed mills reported employing 468 persons as permanent employees and 45 as additional labor for seasonal work. Sixty-six percent of all persons employed were classified as laborers (Table 7).

### Personal Interview Questionnaires

This section is based on an analysis of the data collected by personal interviews from a sample of 19 feed mills located throughout the state.

### Legal Aspects of Ownership

The types of legal organization of the 19 feed mills interviewed

were as follows: corporation, 10; single proprietorship, 6; and partnership, 2. There was 1 joint venture.<sup>4</sup>

Three of the sample mills reported having changed their type of ownership. Two had changed from partnerships to corporations. The reasons for these changes were (1) to limit liability of owners for mill debts, and (2) for tax purposes, to keep the owners' personal tax rates in a lower bracket. One mill had changed from a partnership to a single proprietorship because of a partner's death. None of the managers interviewed indicated having any problems caused by type of ownership.

### Physical Facilities

Eight of 19 mill managers reported that they had made changes in their physical plant facilities during the last 10 years. Fifty percent of the changes in physical plant facilities were additions to storage—generally because of the development of bulk handling and processing. The other 50 percent of the changes were the result of the gradual growth of the mill over time. Changes in physical facilities were most often reported by feed mills which had been in business longer than 5 years. Sixty-three percent of the mill managers interviewed said they were not planning to make any major physical plant changes in the next 5 years. Thirty-seven percent of the mills reported that they did plan to make major changes during the period.

Results from this survey indicated that, in general, mills did not reflect good plant planning. Therefore, in the near future they will have to change or improve their present facilities if they want to stay in business.

Many of the Louisiana feed mills were developed as additions to other pre-existing types of businesses. This is one reason why they were not properly planned and built. As a result, mill owners were later confronted with problems of lack of storage and/or lack of facilities needed for the proper functioning of the mill. The poor planning may also have been caused in part by lack of knowledge or weak management. However, many of their problems resulted from changes in technology, such as the introduction of bulk handling of feed.

Firms' owners who were planning to make changes in their physical facilities reported the addition of bulk facilities and other labor saving devices as possible future plant changes.

Sixteen percent of the millers reported that transportation cost was a problem for them because of poor location. However, most feed mills

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<sup>4</sup>"Joint venture" is a modified type of partnership business, limited in duration, with centralization of authority in a manager in whose name the business will be conducted.



were located on good highways, had access to rail facilities, and were located at the edge of town.

**Processing and storage facilities and plant capacity:** Twenty-six percent of the feed mill managers said that the size of plant, kind of equipment, and amount of automation in their plant was satisfactory for the operation of the firm, while 74 percent indicated that additional mechanization would be profitable for the well-being of the business. Mill operators gave the impression that they were more concerned with improving the efficiency of their plant, than with changing the size of plant.

By increasing the plant size, unit cost can be reduced up to the point of the optimum scale of plant. However, the increase in size also requires an increase in capital invested and working capital, thus increasing capital risk.

The average estimated capital requirements to improve plant mechanization was \$16,000. The range of capital required for additional mechanization was from \$3,000 to \$55,500<sup>5</sup>. There was a positive correlation between these figures and the scale of plant.

The estimated mill capacity on a one shift basis ranged from 20 to 200 tons per day. The mean scale of plant size was 55 tons per day. The average production per day per mill was 30 tons.

The larger mills' average production was equal to half their total mill capacity. The smaller mills' daily average production was greater than half of their capacity. This fact may be one reason why the small mills are able to compete with larger size mills.

Twenty-five percent of the sample mills had no bulk storage of any kind. The average bulk storage for the remainder was 370 tons, which was mostly for grains. Sixty-four percent of mills did not have bulk storage for concentrates and 79 percent did not have bulk storage for prepared feed. Mills having bulk storage used 94 percent of their capacity.

Eighteen mills had an average sack storage capacity of 5,400 sacks.<sup>6</sup> They used an average of 87 percent of their sack storage capacity.

Sixty-three percent of the sample mills had storage problems. They reported their storage capacity was either not enough or that it should be improved. Almost all of the managers felt they were short on bulk storage space. Some of the storage problems were caused by poor planning when the mills were first built.

Twenty-five percent of the managers of sample mills did not think that storing was one of their major problems. Some of the managers in

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<sup>5</sup>One owner stated that \$350,000 would be required to rebuild his plant. This figure was not used since it involved the complete rebuilding of the plant.

<sup>6</sup>One sack = 100 pounds.

this group said they did not have storage problems because they had a rapid turnover of feed supplies.

Other problems associated with storage were reported as follows:

1. Lack of storage space for a particular ingredient or processed feed.
2. Seasonality, which implies not enough storage space during the season and too much during off season.
3. Rodent and insect infestation.

### Management and Degree of Economic Diversification<sup>7</sup>

Forty-eight percent of the firms interviewed were operated as feed mills only. Fifty-two percent were operated jointly with another business. In most cases the joint business was a farm supply store (Table 8). Generally, the feed mill made up from one-third to one-half of the business.

Many Louisiana feed mills came into existence as the result of owners of farm supply stores or grain elevators deciding to expand their operations. However, there were cases where the farm supply store was added to an existing feed mill. In 85 percent of the sample mills, firm management was performed by the firm ownership. As owners or major owners, they did not need an extra incentive to improve managerial performance.

Among the firms in which management was separated from firm ownership, it was found that managers had fairly broad powers in decision-making. However, they were required to consult the board or mill owner for approval in the acquisition of a fixed asset or in any other major expenditure. To stimulate management performance by the hired managers, bonuses based on profits were given to them at the end of the fiscal year.

Trade journals were by far the most widely used publications that feed mill managers used for guidance and planning. Government reports were rarely used. Most of the managers interviewed reported that planning was based mainly on their own experience.

<sup>7</sup>Diversification is a means of supplementing a business by selling added lines of merchandise and services.

**TABLE 8.—Number of Firms Operated Only as Feed Mills and Number of Firms Operated Jointly with Other Types of Business, 19 Feed Mills, Louisiana, 1960**

| Type of operation              | Number | Percent |
|--------------------------------|--------|---------|
| Mill is the only business      | 9      | 48      |
| Mill is operated jointly with: |        |         |
| Farm supply store              | 8      | 42      |
| Grain elevator                 | 1      | 5       |
| Farm                           | 1      | 5       |

## Sales

**Volume of business:** During 1960 the volume of business per mill ranged from \$50,000 to more than \$2 million. Table 9 shows the number and percent of firms by volume of business. Thirty-eight percent of the sample mills had a volume of business of \$100,000 or less. The total volume of business for the 19 sample firms was approximately \$7 million for the year 1960.

Several mills which went out of business were contacted during the survey. They gave low volume of business as the main cause of their failure. Many mill managers felt they did not have a reasonable volume of business. They were trying to find a solution to this problem which in large part is complicated by seasonal variation.

**TABLE 9.—Dollar Volume of Business, 19 Feed Mills, Louisiana, 1960**

| Volume of business | Feed mills |         |
|--------------------|------------|---------|
|                    | Number     | Percent |
| Dollars            |            |         |
| 0 - 100,000        | 7          | 38      |
| 100,001 - 200,000  | 3          | 16      |
| 200,001 - 300,000  | 3          | 16      |
| 300,001 - 400,000  | 2          | 10      |
| 400,001 - 500,000  | 2          | 10      |
| Over 500,000       | 2          | 10      |
| Total              | 19         | 100     |

**TABLE 10.—Average Percent of Business per Quarter, 19 Feed Mills, Louisiana, 1960**

| Quarter                 | Percent of sales |
|-------------------------|------------------|
| January 1 - March 31    | 32               |
| April 1 - June 30       | 19               |
| July 1 - September 30   | 13               |
| October 1 - December 31 | 31               |

Table 10 gives the percent of sales per calendar quarter. Volume of business for the first quarter was about the same as that for the last quarter, while business volumes for the second and third quarters were almost equal. The average percent of sales for the first and fourth quarters was almost double the percent of sales for the second and third quarters. In other words, approximately two-thirds of the feed mill business occurred during the fall and winter months and one-third during the spring and summer.

There was no relationship between the amount of bulk and sack storage and volume of business (Table 11).

**Trends:** Table 12 shows the trend in volume of business, amount of custom mixing, and the amount of feed fed to the mills' own livestock. Twelve managers reported increased business volume during the past

TABLE 11.—Storage Capacity and Percentage of Capacity Used per Volume of Business, 19 Feed Mills, Louisiana, 1960

| Volume of business | Feed mills | Number | Bulk storage     |                  |              | Sack storage**   |                  |              |
|--------------------|------------|--------|------------------|------------------|--------------|------------------|------------------|--------------|
|                    |            |        | Total            | Average per mill | Percent used | Total            | Average per mill | Percent used |
|                    |            |        | — — — Tons — — — | — — — Tons — — — | Percent      | — — — Tons — — — | — — — Tons — — — | Percent      |
| 0 - 100,000        | 7          | 1,009* | 144              | 100              | 1,474**      | 211              | 96               |              |
| 100,001 - 200,000  | 3          | 2,123  | 708              | 89               | 2,100**      | 70               | 75               |              |
| 200,001 - 300,000  | 3          | 1,288  | 429              | 95               | 1,925        | 642              | 84               |              |
| 300,001 - 400,000  | 2          | 325    | 163              | 100              | 189          | 95               | 95               |              |
| 400,001 - 500,000  | 2          | 475    | 238              | 75               | 850          | 425              | 75               |              |
| Over 500,000       | 2          | 527    | 264              | 100              | 645          | 323              | 55               |              |

\* 5 mills had no bulk storage at all.

\*\* 1 mill did not report.



**TABLE 12.—Trends in Volume of Business, Custom Mixing, and Feed Used in Own Operation, 19 Feed Mills, Louisiana, 1960**

| Item                             | Number reporting item as |            |                |
|----------------------------------|--------------------------|------------|----------------|
|                                  | Increasing               | Decreasing | Remaining same |
|                                  | — — — — —                | Number     | — — — — —      |
| Volume*                          | 12                       | 3          | 3              |
| Custom mixing and grinding**     | 11                       | 2          | 3              |
| Used in own feeding operation*** | 4                        | —          | 1              |

\*One mill did not report.

\*\*3 mills did not do custom work.

\*\*\*14 mills did not have a feeding operation of their own.

few years. Custom mixing and grinding and the amount of feed used in their own operations also have been increasing.

The amount of custom mixing depends largely upon the amount of locally produced grain. Presently, managers think a decrease in corn acreage (by the grain bill) will decrease custom mixing. Most managers stated that one of their biggest problems was the instability of government policy.

Future volume will depend mainly on the feeding practices of Louisiana livestock producers. As farmers increase the size of their herds and adopt better feeding practices, the upward trend in volume should continue.

The amount of feed used in their own feeding operation will depend upon the mill's policies. Those firms that had integrated feeding operations were planning to increase them. Those who did not have such an operation were looking upon feeding operations as a potential tool to increase their volume of business.

**Custom Work:** Custom mixing and grinding is an important service performed by Louisiana feed mills. It not only attracts customers but also increases the revenue of the mill. In doing custom grinding and mixing, mills also get some revenue from selling concentrates and supplements. In the Midwest, grain banking provides an additional source of revenue to feed mills, but this survey did not reveal any mills practicing grain banking in Louisiana.

Approximately 22,721 tons of grain, concentrates and supplements, and molasses were sold to farmers by the 16 feed mills that did custom mixing and grinding (Table 13). Three mills did not do custom work.

Theroetically, custom work means the farmer furnishes all the grain to be ground and mixed with molasses and/or concentrates. However, in Louisiana many farmers grow only part of the grain needed. Thirty-two percent of the mills doing custom work reported that farmers in their area grew all the grain required. In these cases, the mill ground and

**TABLE 13.—Tons of Grain, Concentrates and Supplements, and Molasses Sold to Farmers by 16 Feed Mills Which Did Custom Mixing and Grinding, Louisiana, 1960**

| Item                         | Quantity | Percent |
|------------------------------|----------|---------|
|                              | Tons     |         |
| Grains                       | 10,431   | 45.9    |
| Concentrates and supplements | 7,201    | 31.7    |
| Molasses                     | 5,089    | 22.4    |
| Total                        | 22,721   | 100.0   |

mixed the grain and added concentrates and/or molasses. The survey indicated that the larger the mill the smaller the proportion of custom mixing and grinding.

**Sales in Bulk and Sales Delivered:** Of the 19 feed mills, only 10 of them sold some bulk feed. The lowest percent of bulk feed sales was 2 percent and the highest was 100 percent. The longer the mills had been handling bulk feed, the higher the percent of feed sold in bulk. Mills gave the following reasons for not selling in bulk:

1. Lack of adequate facilities in the mill.
2. Poor road maintenance for bulk delivery trucks.
3. Farmers in area do not buy in big quantities.
4. Farmers prefer to buy in sacks.
5. Lack of adequate bulk-feed equipment on the farm to handle feed.

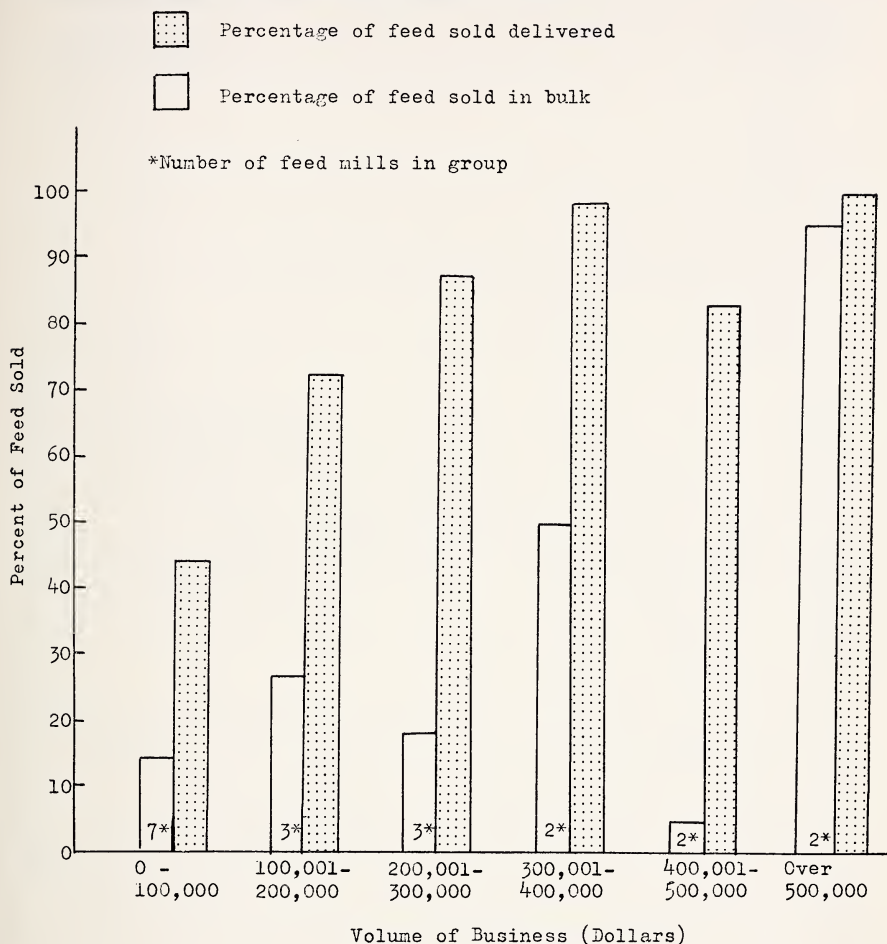
The 10 millers who sold in bulk indicated that there have been changes in bulk buying by farmers in their trade area during the last few years. In areas where poultry and dairying are the main enterprises, most of the feed is sold in bulk.

Figure 3 classifies the percent of feed sold in bulk and delivered, by volume of business. Although there was variability, some positive relationship was noticed between the mill's volume of business and percent of feed sold in bulk. Mills that sold more than 90 percent of their feed in bulk were in most cases large volume mills engaged in large contract feeding operations—mainly for poultry.

The percentage of feed delivered ranged from 6 to 100 percent. The frequency distribution by percent of delivered sales is shown in Table 14. There was some positive relationship between percent of feed delivered and volume of business (Figure 3). Delivery of feed depends upon the size of service area, condition of roads, and the delivery equipment owned by the mill, in addition to other factors.

There is a positive relationship between percent of feed sold in bulk and percent of feed delivered (Figure 3). As farmers and mills "go bulk" the percent of feed delivered will increase, probably to 100 percent.

**FIGURE 3.—Percentage of Feed Sold in Bulk and Delivered, Related to Firms' Volume of Business, 19 Feed Mills, Louisiana, 1960.**



Bulk delivery (of poultry and livestock feeds) will bring certain economies to the farmer and the plant. Some of these are as follows:

1. Eliminate cost of bags.
2. Eliminate labor in filling and sewing bags at the mill.
3. Eliminate labor in storing and handling bags in the warehouse and loading on trucks.
4. Save labor in unloading at the farm.

Although the above economies are brought about by bulk processing, special equipment is necessary both for the feed mill and for the farmer in order to realize maximum efficiency from bulk feeding. In other words, bulk feeding requires an increase in capital invested by the eco-

**TABLE 14.—Frequency Distribution by Percent of Delivered Sales of Feed, 19 Feed Mills, Louisiana, 1960**

| Percent of delivered sales | Number of mills |
|----------------------------|-----------------|
| 1 - 10                     | 1               |
| 11 - 20                    | 1               |
| 21 - 30                    | 1               |
| 31 - 40                    | 1               |
| 41 - 50                    | 2               |
| 51 - 60                    | 1               |
| 61 - 70                    | 0               |
| 71 - 80                    | 3               |
| 81 - 90                    | 2               |
| 91 - 100                   | 7               |
| Total                      | 19              |

conomic units, thus increasing the capital risk of farmers and mill owners.

Bulk delivery equipment in Louisiana is being installed at such a slow pace that it probably will be 5-10 years before most farmers and mill operators will think seriously about changing toward the bulk feeding process. Nevertheless, bulk handling will come faster if mills take the initiative—adding bulk facilities to their plants and buying farm facilities (bins or tanks, feeders, etc.) which can be rented to the farmers. It should be pointed out that this type of change must take place at the farm and at the mill simultaneously.

Louisiana is a state with a large number of small and medium size farms that cannot afford to increase capital investment by changing toward bulk handling and storing of feeds. On the other hand, large size farm operators, mainly because of the cheap source of labor, may stick to the old way of handling and storing feeds. Because of the large amounts of capital investment required and the risky type of enterprise that is involved in the feeding of livestock, many large farm operators are skeptical about increasing their investments on the farm by adding bulk facilities.

The future of bulk handling of feeds is not altogether clear at this time. The feasibility of bulk delivery in varying situations is an area for further research.

**Type of Feed Sold:** Thirty-five percent of the feed sold by mills was dairy feed; cattle feed accounted for 31 percent, and poultry feed for 25 percent. Swine feed accounted for 6 percent of the total feed produced (Table 15).

**Credit to Customers and Producers on Contract:** All the mills interviewed sold feed on credit (Table 16). In most cases they gave 30 days credit similar to other commercial businesses. Credit in general was one



**TABLE 15.—Percentage of Dairy, Poultry, Cattle and Swine Feeds Sold by 19 Feed Mills, Louisiana, 1960**

| Type feed    | Percent |
|--------------|---------|
| Dairy feed   | 35      |
| Poultry feed | 25      |
| Cattle feed  | 31      |
| Swine feed   | 6       |
| Other        | 2       |
| Total        | 100     |

**TABLE 16.—Number of Firms That Sold on Credit and Had Agreements with Producers to Supply Feed, 19 Feed Mills, Louisiana, 1960**

| Description                    | Number of mills | Percent of mills |
|--------------------------------|-----------------|------------------|
| Sold on credit                 | 19              | 100              |
| Did not sell on credit         | 0               | 0                |
| Had agreements or contracts    | 7               | 37               |
| Had no agreements or contracts | 12              | 63               |

**TABLE 17.—Percentage of Feed Sold or Distributed to Specified Outlets, 19 Feed Mills, Louisiana, 1960**

| Sales or distribution outlet | Percent of feed sold or distributed |
|------------------------------|-------------------------------------|
| Wholesaler                   | 1                                   |
| Retailer                     | 2                                   |
| Farmers                      | 80                                  |
| Own use                      | 16                                  |
| Other                        | 1                                   |
| Total                        | 100                                 |

of the big problems of feed mills. This seems to be an area where further research in extension of credit and collection of debts is needed. In addition to creating bad debts, credit also ties up working capital.

Thirty-seven percent of the mills had contracts mainly with producers of poultry. Some feed mills had agreements with producers only during certain months of the year.

According to the managers, 80 percent of the feed was sold to farmers (Table 17), and 16 percent was retained for the mills' own feeding operations. There was a strong belief that this percentage would be higher in the future as more mills engage in feeding operations of their own.

**Sales Promotion:** Ways and degree of sales promotion varied from mill to mill, although in general, larger mills and those with large service areas used more advertising and sales promotion. Fifty-two percent of mills said they did nothing in the way of sales promotion, mostly because they thought there was no need. Besides, they believed farmers in the area were familiar with the feed mill and its services.

Sales promotion methods reported in this survey were (a) radio and newspaper advertising, (b) salesmen and/or servicemen, and (c) mailed advertisements. The need and potential results of advertising seem to be a problem area for many managers.

Most managers said they did not experience difficulty in finding favorable outlets for their products. Those who had difficulties gave the following reasons: (1) competition, (2) very small trade area, (3) low volume during all seasons, and (4) too-small farms.

## Purchases

The 19 mills purchased approximately 50,000 tons of grain during 1960. Corn accounted for 35,373 tons of the grain purchased. Thirty-eight percent of the corn tonnage was produced locally within the region where the mills were located. The mills purchased 5,542 tons of cottonseed meal and 20,515 tons of soybean meal (Table 18).

Approximately 90 percent of the soybean volume was premix poultry concentrate of which the main ingredient was soybean meal.

Most of the corn came from Louisiana. Cottonseed meal not supplied in Louisiana was brought mostly from Mississippi. Feed ingredients (raw materials) purchased out-of-state by Louisiana feed mills were brought mostly from Texas, Mississippi, Arkansas, Missouri, Kansas, and Iowa. Feed mills do not keep a record on the volume of feed for custom milling brought in by farmers.

The list of raw materials most commonly bought, in order of importance, were: corn, oats, cottonseed meal, soybean meal, milo, rice bran,

**TABLE 18.—Amount of Corn, Oats, Cottonseed Meal and Soybeans Purchased, 19 Feed Mills, Louisiana, 1960<sup>1</sup>**

| Item               | Total  | Produced locally | Shipped in |
|--------------------|--------|------------------|------------|
|                    | Tons   | Percent          | Percent    |
| Corn*              | 35,373 | 38               | 62         |
| Oats**             | 3,277  | 12               | 88         |
| Cottonseed meal*** | 5,542  | 26               | 74         |
| Soybean meal****   | 20,515 | 9                | 91         |

\*Five feed mills did not give tonnage of corn purchases—corn includes shell corn and ear corn.

\*\*Six feed mills did not give tonnage of oats purchased and 3 feed mills did not use it.

\*\*\*Six feed mills did not give tonnage of cottonseed meal purchased and 2 feed mills did not use it.

\*\*\*\*Includes 19,620 tons of premix, with soybean meal as the main ingredient. Six feed mills did not give the tonnage of soybean meal purchased. Eight feed mills did not use it.

<sup>1</sup>Data on milo, barley, molasses, rice bran and wheat were not available.

wheat bran, barley and alfalfa. The importance of molasses relative to other materials was not determined.

Sixteen millers reported that they did not experience difficulty in obtaining supplies of raw products. The other three reported that occasionally they experienced difficulty and that this happened generally a month before harvesting season.

Consignment, as a purchasing arrangement, was not reported by any of the sample mills. Ninety-seven percent of all purchases were by cash payments and 3 percent were by deferred payments. All of the sample mills were required to pay cash<sup>8</sup> for most of their purchases of raw materials (Table 19). This necessitated large amounts of working capital by the feed mill owners.

**TABLE 19.—Purchasing Arrangements of 19 Feed Mills, Louisiana, 1960**

| Type arrangement | Number mills <sup>1</sup> | Percent of purchases |
|------------------|---------------------------|----------------------|
| Consignment      | 0                         | 0                    |
| Cash payment     | 19                        | 97                   |
| Deferred payment | 2                         | 3                    |
| Total            | 19                        | 100                  |

<sup>1</sup>Two mills reported using both cash and deferred payment arrangements.

**TABLE 20.—Sources of Competition Indicated by 19 Feed Mills, Louisiana, 1960**

| Source of competition                                         | Number mills <sup>1</sup> | Percent of mills |
|---------------------------------------------------------------|---------------------------|------------------|
| Farm supply stores                                            | 11                        | 58               |
| Mobile feed mills                                             | 0                         | 0                |
| Farmers installing their own grinding<br>and mixing equipment | 6                         | 32               |
| Others (cooperatives)                                         | 5                         | 26               |

<sup>1</sup>Some mills reported more than one source of competition.

## Competition

Feed mills face competition from other industries as well as from other feed mills (Table 20). Fifty-eight percent of the millers thought they had more competition from farm supply stores than from any other source. Such stores sell nationally known brands of feed. None of the millers reported competition from mobile feed mills, and only 26 percent reported competition from farmers installing their own grinding and mixing facilities. There is the belief that as mills become more efficient this latter kind of competition will disappear.

Farmer cooperative stores also were a source of competition. In some areas mill managers were really concerned about such cooperatives.

<sup>8</sup>Cash payments include 30 day credit.

## Capital Requirements

Table 21 shows the value of land, buildings, equipment and inventory of the sample feed mills included in the study. Milling and delivery equipment accounted for 45 percent of total investment. The total investment for all of the 19 sample mills was \$1,557,450. Investment per mill ranged from \$15,000 to \$246,000. The average investment per mill was about \$80,000. The range in average inventory of feed was from \$500 to \$146,000. Most mill managers said they moved feed as fast as possible due to shortages of working capital and/or storage.

Thirteen mills had investments of less than \$100,000. Investments in eight of these were under \$50,000 (Table 22).

**TABLE 21.—Total Land, Buildings, Equipment, and Inventory, Reported by 19 Feed Mills, Louisiana, 1960**

| Description | Investment              | Average per firm | Percent |
|-------------|-------------------------|------------------|---------|
|             | — — — — Dollars — — — — | — — — —          |         |
| Land        | 73,450*                 | 3,866            | 5       |
| Buildings   | 369,500                 | 19,447           | 23      |
| Equipment   | 700,000                 | 36,842           | 45      |
| Inventory   | 414,500                 | 21,816           | 27      |
| Total       | 1,557,450               | 81,971           | 100     |

\*Six feed mills leased their land.

**TABLE 22.—Frequency Distribution, Total Investment, 19 Feed Mills, Louisiana, 1960**

| Total investment  | Feed mills |         |
|-------------------|------------|---------|
|                   | Number     | Percent |
| Dollars           |            |         |
| 0 - 50,000        | 8          | 42      |
| 50,001 - 100,000  | 5          | 26      |
| 100,001 - 150,000 | 3          | 16      |
| 150,001 - 200,000 | 1          | 5       |
| 200,001 - 250,000 | 2          | 11      |
| Total             | 19         | 100     |

**TABLE 23.—Mill Capacity and Average Daily Production Related to Total Investment, 19 Feed Mills, Louisiana, 1960**

| Total investment  | Feed mills | Average per class    |            | Service area |
|-------------------|------------|----------------------|------------|--------------|
|                   |            | Capacity             | Production |              |
| Dollars           | Number     | — — — — Tons — — — — |            | Miles        |
| 0 - 50,000        | 8          | 40                   | 19         | 19           |
| 50,001 - 100,000  | 5          | 44                   | 28         | 22           |
| 100,001 - 150,000 | 3          | 72                   | 38         | 36           |
| 150,001 - 200,000 | 1          | 50                   | 30         | 58           |
| 200,001 - 250,000 | 2          | 140                  | 75         | 38           |



Mill capacity, average production per day and the size of service area with total firm investment are shown in Table 23. Except for mills in the \$150,001 - \$200,000 group, there was a positive relationship between total investment and mill capacity and average daily production. There was no apparent correlation between investment and size of service area.

### **Pricing**

Feed mill managers reported that the price of the supplies they bought was determined by the current market price, as quoted by sellers. They felt they had no effect on supply prices. That is to say, feed mills had no influence on the price of the supplies they bought.

In setting the price of products they sold, 11 mills said they set the price according to cost. The remainder of the mills interviewed said they basically attempted to meet competitors' prices, but when possible, they set the price according to cost.

### **Financing (Credit to the Firm)**

Fifty-eight percent of the millers indicated that they have financial problems. Feed mills require a relatively large amount of working capital due to the fact that they have to pay cash on delivery, or within 30 days, for all the raw materials or ingredients they use. At the same time they have to extend open account credit, which is generally interest free on a monthly billing basis. When they engage in a feeding operation on contract with local farmers they finance all the feed used until the product is sold. Most operating loans were provided by local commercial banks at a rate of 5 to 6 percent. Very few managers were familiar with the Small Business Administration. The few who said they knew about the Small Business Administration indicated that too much "red tape" was required in order to obtain a loan.

### **Labor**

Labor cost was a problem for 37 percent of the feed mills. In some mills, seasonality affected efficiency of labor utilization. Unemployment and workmen's compensation insurance was believed to be too high by most mills. Mills with old equipment (lack of automation) required too much labor. In many mills, labor was the biggest expense. Next in order of importance were transportation costs and depreciation.

Labor turnover was not a major problem among feed mills in Louisiana. Neither were they confronted by any problem in obtaining, training or keeping labor. Labor is relatively abundant in Louisiana, especially in rural areas. Technology has developed mill equipment that is easy to handle, thus reducing the need for skilled workers.

The sample mills had 164 permanent employees and 32 temporary

workers for seasonal work (Table 24). Unskilled laborers made up 61 percent of mills' personnel requirements. It was found that only unskilled laborers were employed for seasonal work. Most of them were employed during the fall and winter seasons of the year.

### Trade Area

The radius of the service area for the sample mills ranged from 9 to 58 miles and the average radius was 28 miles. Size of trade area varied according to the mill location, accessibility to parish roads and highways, and size and number of farms in the area, in addition to other factors. Size of service area was not closely associated with the volume of business (Table 25).

**TABLE 24.—Permanent and Seasonal Personnel Requirements, 19 Feed Mills, Louisiana, 1960**

| Type          | Permanent |        | Additional for seasonal work |         |         |         |
|---------------|-----------|--------|------------------------------|---------|---------|---------|
|               | Male      | Female | First                        | Second  | Third   | Fourth  |
|               |           |        | quarter                      | quarter | quarter | quarter |
|               | —         | —      | —                            | Number  | —       | —       |
| Manager       | 19        | 0      | 0                            | 0       | 0       | 0       |
| Supervisor    | 9         | 0      | 0                            | 0       | 0       | 0       |
| Office worker | 5         | 14     | 0                            | 0       | 0       | 0       |
| Laborer       | 100       | 0      | 25                           | 5       | 12      | 32      |
| Salesman*     | 7         | 0      | 0                            | 0       | 0       | 0       |
| Others**      | 11        | 0      | 0                            | 0       | 0       | 0       |
| Total         | 151       | 14     | 25                           | 5       | 12      | 32      |

\*In some mills salesmen were also servicemen.

\*\*Includes servicemen, drivers, and others.

**TABLE 25.—Size of Service Area Related to Volume of Business, 19 Feed Mills, Louisiana, 1960**

| Volume of business | Feed mills | Service area radius |
|--------------------|------------|---------------------|
| Dollars            | Number     | Miles               |
| 0 - 100,000        | 7          | 19                  |
| 100,001 - 200,000  | 3          | 33                  |
| 200,001 - 300,000  | 3          | 34                  |
| 300,001 - 400,000  | 2          | 16                  |
| 400,001 - 500,000  | 2          | 31                  |
| Over 500,000       | 2          | 39                  |

# A General Description of the United States Feed Mill Industry

The purpose of this section is to show how others have dealt with problems of volume, market size, firm size, labor efficiency, and increasing output to reduce cost. It also attempts to review future trends and problems facing the feed mill industry.

## Efficiency

In a study at Purdue University,<sup>9</sup> it was found that the largest expense in grinding and mixing feeds was labor. It also was found that the relative efficiency in a feed mill depended on the efficiency of working time and proportions of idle time. Specific differences in work methods affected working time used on specific operations. General factors, such as the scale of operation, crew organization and scheduling, seasonality, grinding and mixing pattern, type of customer, and competence of management, affected the idle time.

According to a study at the University of Tennessee,<sup>10</sup> many factors go into determining the final cost of feed to the farmer. For feed ingredients, such factors as quality and transportation have a great effect on the final cost of the feed. This indicates that mill managers have many things to observe in their operations. They should be constantly on the alert to take advantage of all cost reducing ideas that might affect the efficiency of the mill operations. The study also states that managers should be particularly interested in comparing the efficiency of their mill from the point of view of business analysis with other mills of the same size and in about the same area of operation.

Phillips<sup>11</sup> analyzed the costs of procuring, manufacturing, and distributing mixed feeds in the Midwest under four types of organization. This case study indicated that four local mills, located in a grain surplus area and operating at a volume of 10,000 tons per year, can be just as efficient and possibly a little more efficient than a mill with an output of 40,000 tons per year, but which operates from a centralized position. In each of these case studies all costs were considered, from the

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<sup>9</sup>Charles E. French, *Labor Efficiency in Grinding and Mixing Feeds*, Purdue University Agricultural Experiment Station Bulletin No. 639.

<sup>10</sup>A. J. Garbarino, *Operating Practices and Costs of Selected Mixed Feed Mills in the South*, University of Tennessee Agricultural Experiment Station Monograph No. 269.

<sup>11</sup>Richard Phillips, *Costs of Procuring, Manufacturing and Distributing Mixed Feed in the Midwest*, U.S. Department of Agriculture, Agricultural Marketing Service, Marketing Research Report No. 388.

cost of the ingredients through the delivery of the formula feed to the farmer.

The types of mills were as follows: (1) the local mixers who were assumed to mix and retail all feed from one position, (2) the centralized or non-local mixers who sold formula feed through retailers (who merely retailed), (3) the non-local mixers who sold formula feed through retailers (who mixed a mixing supplement with local grains), and (4) centralized mixers who sold formula feed through mixing and retailing units (who used only the manufacturer's premix).

## Competition

Brensike states:

"Small manufacturers need not be operating at any sizeable cost of production and marketing disadvantages in surplus grain areas. They have the advantage in a service industry of being on the spot. But they can lose this advantage or relative equality through failure to keep up with industry changes or changes in costs. They can lose it by not being able to sell their services competitively to the farmer, who should be their customer."<sup>12</sup>

This study indicated that there has been a large increase in the number of feed mills located in feed deficit areas. In other words, this shift from the corn belt or surplus grain production areas to grain deficit areas is part of the general trend toward more direct demand orientation of the industry. This, in many instances, reduces transportation costs and also reduces the size of the average plant volume.

The shift toward local demand orientation is an advantage the local mixer has over a larger competitor. The closer a firm is to its customers the better off both are, especially in a service industry. Small local feed mills have an important place in the present feed mixing industry. With the right type of management, equipment and location they can compete freely and soundly.

Brensike<sup>13</sup> says that local feed mills must keep up with advancements in technology or changes in the industry with regard to: (1) bag versus bulk sales, (2) integration, both horizontal and vertical, (3) stationary and mobile custom mixing, (4) use of grain banks, (5) farmer mixing, (6) local mixer and farmer demands for mixing or feeding concentrates versus complete feeds, and (7) direct selling.

Managers should always know their milling charges and recognize

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<sup>12</sup>J. V. Brensike, U.S.D.A., "The Competitive Position of Small Commercial Feed Mills." *Feedstuffs*, June, 1960, p. 92.

<sup>13</sup>*Ibid.*, p. 93.



that they are in a service industry when adjusting their business with the different trends in the industry. Knowing the charges will help a mill owner or manager make decisions on whether to buy some labor-saving equipment and whether to add pelleting, bulk delivery, new credit plans, or a grain bank to the present operation.

## Planning

Smith<sup>14</sup> reports that custom milling in the United States has grown to be a business of tremendous importance to the agricultural community and has a remarkable future.

To build a complete custom feed mill takes time and it should be done through step-by-step planning. Feed mills that have not been designed for the future, or to keep up with technological advancements, are not able to maintain their competitive position.

In planning a mill, a market survey appraising competition and services needed to compete successfully should be made first; next comes site selection and, finally, the designing of the mill.

In site selection one should keep in mind that the mill should be located where it will have easy access to roads which will take heavy trailer truck traffic, and, if possible, on a railroad siding. Availability of electrical power, water supply, and fire protection should also be considered. In order to avoid excessive excavation and footing costs, mills should not be built in soils that are too humid.

An engineer or an expert in the field should be employed to assist in the selection of equipment and designing of the mill in order to avoid future complication when adding new equipment or new storage facilities.

## Grain Banking

Grain banking is a technique by which a farmer stores grain in a feed dealer's facilities to be withdrawn at a later date in the form of mixed feeds.

With a grain bank plan, a custom mill owner can give better service. Under this plan a mill grinds, mixes and delivers feed on a pre-planned schedule. The farmer does not just show up at the mill with a load of grain and have to wait for service. With this technique he can plan ahead. This saves him labor and time and helps the mill in preparing its schedule of work. The mill can better utilize its facilities, and thus become more efficient.

Grain banking has been used by grain elevators and feed mills for

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<sup>14</sup>O. B. Smith, "Important Considerations Before Building a Custom Feed Mill," *Farm Store Merchandising*, January, 1961, p. 30.

over 40 years, but has been popularized since World War II. According to many authorities it will play an ever-increasing role in the future of the feed mill industry.

Ecker<sup>15</sup> divides grain bank advantages into two groups:

**A. Advantages for the Feed Dealer:**

1. Increases concentrates sales.
2. Increases service income (grinding, mixing, trucking).
3. Helps combat farm mixing.
4. Guarantees customer business.
5. Makes more efficient utilization of labor.
6. Provides more efficient utilization of equipment.
7. Provides more efficient utilization of storage facilities.
8. Helps obtain and hold new customers.
9. Makes better feeding records available.
10. Provides more profits for seller.

**B. Advantages for the Feeder:**

1. Saves labor.
2. Is more convenient.
3. Reduces grain spoilage.
4. Allows earlier harvesting.
5. Makes it easier to balance rations.
6. Reduces storage costs.
7. Reduces insurance costs.
8. Makes feed deliveries easier to schedule.
9. Provides more profit for the feeder.

The need for a grain bank is not only related to the advantages mentioned but also depends upon the type of farming area. This includes kind and amount of feed grain produced, type and number of livestock on feed, harvesting methods, and amount of on-the-farm storage in the area.

A feed mill manager, in evaluating the addition of a grain bank, should keep in mind its economic feasibility and the need and probable usage of grain banking as a service to the mill customers and farmers of the area.

In a corn belt study, Farris<sup>16</sup> of Purdue University suggests alternative policies for operating specific phases of a grain bank service for customers. He reports that about 2,000 grain banks are used by corn belt farmers.

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<sup>15</sup>H. J. Ecker, "The Economics of Grain Banking," *Farm Store Merchandising*, May, 1961, p. 24.

<sup>16</sup>W. S. Farris, "Operating a Grain Bank," *Feedstuffs*, January 20, 1961, p. 74.

He pointed out that although grain banking arrangements have filled many new demands made by customers, there are still some problems to be solved in the grain banking phase of the feed mill industry.

Problems found in grain banking and the alternative policies to follow in overcoming such problems are listed below:

(1) **Limited Storage Space** — Many mills or grain elevators run short of storage for grain brought in by the grain bank customers. To overcome this problem firms can (a) build additional storage, (b) store the grain at terminals, (c) sell grain and agree to replace it, or (d) restrict amount farmers can bring in to be stored.

(2) **Overdrawing Grain Account** — Farmers many times overdraw the quantity of grain they have had stored in the grain bank. This is a serious problem, especially when the mill has to buy grain at a high price. As solutions to this problem Farris suggests that firms should (a) not permit overdraft, (b) charge a retail price for all overdrafts, or (c) allow a period of time in which the farmer has to return or replace the amount of grain overdrawn.

(3) **Moisture Content of Grains** — Farmers using grain banking often bring the grain with a higher percent of moisture than is acceptable for long storage. Operators must check moisture content, and must have ways to make adjustment. Mills who trade bushel for bushel without regard to moisture content will have difficulty in the long run. Ways to prevent this problem are (a) accept only dry corn, (b) charge for drying the corn, or (c) provide adequate drying capacity for all customers.

(4) **Providing Grain Bank Delivery Service** — Delivery is one of the time-saving features of grain banking. In grain banking, managers are faced with the decision of providing delivery service and what price to charge for this service. Alternative policies are (a) do not deliver, (b) deliver only to large bulk customers, (c) make a minimum charge regardless of size of delivery and add a charge per ton above minimum, (d) deliver to any customer and charge by mile over minimum, or (e) handle delivery costs as overhead.

(5) **Determining Charge for Grain Bank Services** — This is a problem especially where additional labor and facilities are required. Costs in providing this service should determine the rate to be charged.

Possible solutions to this problem are (a) charging for the service at cost plus a reasonable margin, (b) treat costs as overhead (thus do not charge), or (c) charge current rate regardless of cost-profit considerations.

Farris also states,

"Even though many problems are connected with the offering of grain bank services, it is apparent that many farmers are willing to use these services and willing to pay for them.

"The manager has a responsibility to help the farmer understand the problems connected with grain bank services as well as to inform him of the advantages of using them."

## Mobile Feed Mills

Mobile feed mills have many of the characteristics and perform all of the services of a stationary custom feed mill. Mobile mills are mounted on trucks. Revenue is mainly from fees for grinding and mixing feed and from sale of concentrates or supplements and molasses which are mixed with the farmer's grain at the farm. A mobile mill can be a department of a stationary feed mill or can be a mill by itself.

Mobile feed mills are becoming very popular in some areas of the country. At first the portable unit (truck-mill) was just a grinder. However, advancement in technology and a desire on the part of farmers for more complete feed have required today's mobile units to also have facilities for mixing feed and adding molasses.

The operation of this type of mill is usually a one-man job. Where this mill succeeds in operating there will be found a closer relationship between the farmer and the mill operator.

A mobile feed mill needs enough customers to provide a reasonable volume of business and needs good roads in the service area of the mill. Mobile mills do well where farmers grow the grain needed for feed and have enough storage facilities for the grain.

When the survey for this study was made there was not a well organized mobile milling operation in Louisiana.

## On-Farm Mixing

In comparing on-the-farm versus local mill mixing, Roddis<sup>17</sup> says that the present tendency of farmers to own grinder-mixer equipment is a result of changing feeding and production methods. Feed mills must counteract this tendency by having reasonable service charges and some other approaches that will keep them attached to the mill. Once the farmer has his own grinder-mixer installed it is very difficult to win his business.

In his article, Roddis stated that based on a survey it was found that

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<sup>17</sup>D. E. Roddis, "On-the-Farm vs. Local Mill Mixing," *Farm Store Merchandising*, March, 1962, p. 63.



the reasons farmers bought their own equipment were as follows: (1) convenience, farmers can grind and mix feed at their leisure; (2) they can leave a full batch of feed in the mixer and have it ready in case there is a busy time ahead of them; (3) farmers can mix large or small quantities of feed according to the needs of their animals; (4) farmers believe they are saving money when buying the grinding and mixing equipment.

Most likely a farmer buys his own grinding and mixing equipment because he does not really want his own grain to leave the farm. He wants to save the freight or hauling expenses both ways and the labor involved.

Even after the farmer buys his own equipment he needs everything that goes into a balanced ration, except grain and roughage. This is an open door for the feed industry to furnish supplies, especially if mills are better equipped and prepared to provide a better service from a cost and nutrition standpoint.

In many cases on-farm mixing results in poor and costly rations, thus adding inefficiency to the operations of the farm.

Roddiss concludes with the belief that commercial mills are better equipped to handle and prepare feed for the farmer. Commercial mills not only have better equipment to handle and prepare feed but also they can make more efficient use of machinery. The mills are up-to-date in nutrition research. Knowledge that is passed out thus results in greater profits for the farmer. Mills have trained personnel to provide better service to the farmers. They also have a general knowledge of feed and feeding problems.

Mutti,<sup>18</sup> of the University of Illinois, said, "The increase in the proportion of animals fed in larger size operations increases the possibility of mixing more ingredients close to the point of feeding. And strong economic forces suggest further mixing of feeds at points of consumption, but it appears likely that the advantages won't be as great in the next five years as the past five."

He said that the disadvantages of on-farm mixing of commercial supplements with farm-grown feeds outweigh the advantages. The most important disadvantages to the farmer who grows his own grain and buys concentrates or supplement to be mixed at the farm, are: (1) cost of on-farm mixing will be high as livestock production will be continued on a large number of relatively small sized units; (2) nearby mills are offering many improvements in the types and performance of services (grain drying, storage, bulk delivery, etc.); (3) mills can provide grain needed in a feeding operation, which is not grown locally, at a lower

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<sup>18</sup>R. J. Mutti, "Feed Distribution Methods—Part 3—On-Farm Mixing," *Feedstuffs*, June, 1961.

cost than the farmer is able to get it for himself; (4) many farmers cannot bear the risk of tying up capital in feed-mixing equipment.

Ray<sup>19</sup> pointed out the following trends: Presently there is an increasing per capita consumption of livestock products. Population by 1965 will be 10 percent above 1960. Farmers will continue to improve their feeding practices, and feed tonnage will increase.

As the industry goal is efficient production of meat, milk and eggs, in the future farmers will be searching for the most efficient way of producing them. The most efficient method will tend to be the one which requires the least number of hours of labor, least cost of transportation of ingredients and feed combined, and will minimize the times ingredients and feed will be handled.

Ray also says that in the future mills will be smaller and closer to the areas where livestock is produced. New plants will have a high degree of automation and therefore, low labor requirement per ton.

Mills will produce fewer different types of feed. Mills will find it profitable to drop several of their lowest volume items and concentrate on fewer kinds of feed.

In the future more attention will be placed on economics of purchasing ingredients. Linear programming will be a useful tool in decreasing total cost of a feed.

There will be an increase in bulk delivery direct from the mill to the farm, especially in areas that can take advantage of bulk handling of feeds.

There will be an increase in feed "programs" including production services and end-product marketing services. In other words, the feed industry will provide increasing amounts of assistance in locating the end-product market and will help farmers in planning the production and marketing of the product.

According to a study by C. J. Vosloh, Jr., and J. V. Brensike,<sup>20</sup> "the structure and practices of the feed mixing industry have been greatly affected by trends inside and outside the industry itself." They said that on-farm mixing has increased in recent years, especially on large farms or areas with large feeding operations. On-farm mixing is correlated to the availability of the farmer's supply of home grown grains, but apparently it was found that custom mixing and grain bank operations have counteracted this trend in grain surplus areas.

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<sup>19</sup>O. M. Ray, "A Five-Year Look Ahead at Feed Manufacturing and Distribution," *Feedstuffs*, February, 1961, p. 100.

<sup>20</sup>C. J. Vosloh, Jr., and J. V. Brensike, *The Changing Feed Mixing Industry*, Marketing Research Report No. 506, Marketing Economics Division, Economics Research Service, U.S.D.A., 1961.

As many farmers have started to grow their own grain, there has been a shift from complete feeds toward concentrates or supplements. This is to say that feed mills—especially those that do custom mixing—have been selling more concentrates or supplements than in the past.

There has been a uniform growth of direct feed sales. The volume of feed sold direct to farmers has increased at a slow pace.

There is a trend toward bulk sales and delivery which is more rapid in some areas than in others. Feed mill operators have the opinion that bulk feed sales have a tendency to decrease prices. This study also points out that the trend towards sales in bulk helped both the stationary and mobile custom-feed millers.

## Summary and Implications

This study is the first attempt to describe and define the feed mill industry in Louisiana. The specific objectives of the study were to obtain a clearer picture of the industry in Louisiana by describing the properties and characteristics of the industry and to define or point out problems, and, where possible, to suggest solutions. The data for the study were collected by a mail questionnaire and by personal interviews with a sample of mill operators in the state.

During 1960 there were 43 feed mills in Louisiana. Fifty percent of the firms were organized as corporations and 38 percent were single proprietorships. The average trade area per mill had a radius of 30 miles. The average replacement value per mill was \$90,000. Most of the mills started in business after World War II, indicating that the feed mill industry is relatively new in Louisiana. A total of 513 persons were employed by the 39 mills reporting in 1960. These mills paid out approximately \$2 million in salaries during the year.

Sixty percent of the mill managers interviewed were not satisfied with the arrangement of their plant facilities, especially the storage facilities, location of mill and degree of mechanization. It was estimated that an average of \$16,000 per mill would be required to modernize the existing feed mills in the state.

The average scale of plant was 55 tons per day. The average daily production of mills surveyed was 30 tons. The larger mills had more storage capacity and did a smaller amount of custom work than did small mills.

Diversification is common in the feed mill industry. Of the 19 mills, 8 were operated jointly with a farm supply store, 1 with a grain elevator, and 1 was operated in conjunction with a farm. The remainder were operated as feed mills only.

Some of the feed mills in Louisiana began as an out-growth from farm supply stores, while others began originally as feed mills. They still do a certain amount of retailing, as do farm supply stores. Most of the mills mix and grind their own brand of feed; however, a large amount of their business volume is custom mixing and grinding. As firms increase in size the volume of custom work decreases. A few millers reported doing only custom work. There are some specialized types of mills (mostly poultry feed) with a high degree of integration.

Generally, the management of Louisiana mills was not separated from firm ownership. Eighty-five percent of the managers were the owners or major owners of the firms.

The feed millers interviewed had a total volume of business close to \$7 million during 1960. Thirty-seven percent of the sample mills had a volume of \$100,000 or less. During 1960 the volume of business ranged from \$50,000 to more than \$2 million.

Producer contracting by mills was limited and used mainly by specialized types of feed mills. Most of the feed sales were made to farmers in the local area where the feed mill was located. The larger the mill, the lower was the percent of feed sold directly to farmers. Sixteen percent of the mills' total production was used for the mills' own feeding operations.

Fifty-two percent of the millers did nothing in the way of sales promotion. Among the remainder sales promotion varied from mill to mill.

Millers bought more than 50,000 tons of grain during 1960. Of this tonnage, 35,373 tons were corn. Most of the corn bought by the mills surveyed came from Louisiana. A large quantity of cottonseed meal came from Mississippi. Soybean meal and other grains were obtained mostly from other states. In general, there were no problems in obtaining supplies of feed ingredients.

Prices of raw products purchased by the mills generally were fixed by the supplier. Feed prices charged by the mills were set according to a markup over cost, although in some cases, they were determined by attempting to meet competitor's prices. Most of the competition came from nearby feed mills, farm stores, and farmer cooperatives stores.

All of the millers interviewed sold feed on credit. In most cases they gave 30 (or more) days credit similar to other commercial businesses. Bad debt loss was a problem among feed mills.

Millers paid cash on delivery, or on a 30 day credit basis, for all the raw materials or ingredients they used.

The total investment for the 19 sample mills included in the study was \$1,557,450. Land, buildings, milling and delivery equipment, and inventory were 5, 23, 45, and 27 percent, respectively, of total investment.



## Problem Areas

The main problems associated with feed mills as found in this study were:

1. Lack of storage capacity.
2. Low and seasonal volume of business.
3. Bad debt loss.
4. Financing, or lack of credit to the firm.
5. Lack of, or insufficient, sales promotion.
6. Poor labor utilization.
7. Lack of information on costs.

## Recommendations

(1) The lack or excess of storage capacity is a problem among Louisiana feed mills. This may have been caused by poor planning of the mill and/or changes in technology, e.g., bulk handling and processing of feed. Lack of bulk storage is a segment within the larger problem of lack of storage capacity. It should be pointed out that most of the present bulk storage capacity was for grain. Seventy-two percent of the millers interviewed did not have bulk storage for concentrates and prepared feed. *Millers with plenty of bulk grain storage capacity, which is wasted during off season, should look into the possibility of adopting a grain banking operation. Millers who lack storage capacity should carefully consider trends in future feed demand and technology before expanding.* One recent trend which affected storage was bulk handling of feed.

(2) Probably the most important problem among feed millers was the low volume of business. This problem is also greatly affected by seasonal variation. It should be pointed out that by increasing sales, efficiency of plant and labor will thereby be increased, thus reducing per unit cost. *Many millers are considering feeding operations of their own as a measure to counteract the low and seasonal volume of business.*

(3) Credit to customers was a problem area. All of the millers sold feed on credit. Many managers indicated that they often had trouble collecting credit accounts. In addition to bad debt loss, credit increased the amount of working capital required for operation of the mill. *Feed mill managers should review their customer credit policies to help reduce bad debt losses.*

(4) Financing by the mill was another problem. Interest rates were high and there were few known sources of credit. The average total investment, including working capital, was \$80,000. *Financing requires that obsolescence be kept in mind, as well as relative efficiencies of machines and labor, before deciding to initiate new capital investment.*

(5) Poor quality or lack of sales promotion was identified as a problem among feed mills. *The need to increase the volume of business suggested that the potentials of sales promotion have not been exploited.* The area of nonprice consideration in competing for the farmers' feed business seemed to be unknown by managers. The feed mill industry is also a service industry. *There are additional services they can perform in order to attract customers* (e.g., livestock sales pavilion, postcard order blanks, cooperation with county agent, one-day service policy, providing servicemen).

(6) Labor utilization was a problem area for most of the millers. Labor efficiency was affected primarily by seasonality and the degree of mechanization. *Feed mill managers should consider some complementary enterprises to improve labor use.*

(7) As is always the case in a business firm, costs help determine profits. However, most of the feed mill managers knew very little about specific costs. In general, there was insufficient information on cost to determine economic efficiency. *Feed mill managers should give more attention to their costs for each operation so they can measure their efficiency against other firms in the industry.*

### **Suggested Areas for Further Research**

The areas of further research needed to solve the main problems are:

1. *Storage capacity*—A study is needed to determine whether the addition of storage is economically justifiable in various situations. Also, a study should be conducted on whether to follow the trend toward grain banking. Along this line a study to determine frequency and volume requirements of feed and ingredients might help to alleviate the lack or excess of storage capacity or help to use storage more efficiently.

2. *Sales*—As many factors influence the volume of business, it is believed that any study which will have the direct or indirect objective of increasing feed mill volume of sales will be helpful. In this area a study on seasonal volume is needed. As mills consider entering feeding operations to increase their volume, a study relating size of mill with size of feeding operation also would benefit firms in the state.

3. *Credit to customers*—Credit to customers is an important research problem. More information on extension of credit and collection of debts by feed mills is needed.

4. *Feed mill financing*—Credit to the mill is another area of necessary research. A study on availability, cost, and sources of mill financing would be worthwhile to the feed mill industry. Also, a study on the type of financing of feeding operations of a feed mill should be undertaken.

Capital requirements on new machinery required by improved technology should be studied.

5. *Sales promotion*—The need and potential result of advertising should be investigated. Research on services that a mill can perform to attract customers should be explored.

6. *Labor efficiency*—Labor utilization was a problem area for most of the mills. Labor efficiency as affected by seasonality, degree of mechanization and other factors should be studied. Also, research on handling and processing of feed at the mill and at the farm should greatly benefit the feed mill industry.

7. *Feed mill cost*—Averages and ranges of costs of factors of production per unit of output will give feed mill owners a guide as to their efficiency. This will give them a "yardstick" so they can evaluate their own costs and take necessary action.

Additional research topics that should be considered for the future are:

1. Contracting from mill and producers standpoint (mill and producer contracting).
2. Degree of economic diversification of feed mills.
3. Ways to improve the efficiency of feed mill operations.
4. Possibility of creating an association of feed mill owners.
5. Minimum facilities for efficient feed mills of different sizes in Louisiana.
6. Accounting practices of feed mills and use of accounting records in decision making.

Each of these topics was mentioned directly or indirectly by one or more of the feed mills interviewed.

## Implications

The Louisiana feed industry is expanding. Some changes within its institutional framework have occurred and many more changes will be made within the next decade. As Louisiana farmers adopt better feeding practices and increase livestock numbers, the demand for feed will increase and thus will increase the potential market for the feed mill industry.

As this growth takes place feed mills will encounter more problems. Therefore, research on present problems will place feed mills in a better position to meet the new problems that will arise. Solving these problems will benefit feed mills as well as farmers and consumers of end-products.

# Appendix

## A. Mail Questionnaire

CONFIDENTIAL

### DEPARTMENT OF AGRICULTURAL ECONOMICS LOUISIANA AGRICULTURAL EXPERIMENT STATION LOUISIANA STATE UNIVERSITY

1. Name of Firm \_\_\_\_\_  

(Address) \_\_\_\_\_
(Town or City) \_\_\_\_\_
(Parish) \_\_\_\_\_
2. What is the nature of your business?<sup>1</sup> (For example, feed, seed and fertilizer retail store, feed mixing, sawmill, grain elevator, canning plant, etc.) \_\_\_\_\_
3. How long has this firm or its predecessor been in business? \_\_\_\_\_
4. Present type of ownership (Check one):  

Private \_\_\_\_\_
Cooperative \_\_\_\_\_

Partnership \_\_\_\_\_
Corporation \_\_\_\_\_

Other (Specify) \_\_\_\_\_
5. Type of physical organization (Check one):  

Single plant \_\_\_\_\_
One of two or more in the state \_\_\_\_\_

Part of national chain \_\_\_\_\_
Other (Specify) \_\_\_\_\_
6. (a) Size of service area for this plant (Fill in blanks below):  

North \_\_\_\_\_ miles
South \_\_\_\_\_ miles

East \_\_\_\_\_ miles
West \_\_\_\_\_ miles
- (b) Number of parishes served \_\_\_\_\_
7. What is the estimated replacement value of your facility? \_\_\_\_\_
8. Number of employees (Fill in appropriate blanks):

| Type                  | Permanent |        | Additional<br>for Seasonal Work |        |
|-----------------------|-----------|--------|---------------------------------|--------|
|                       | Male      | Female | Male                            | Female |
| Manager               |           |        |                                 |        |
| Office Workers        |           |        |                                 |        |
| Field Representatives |           |        |                                 |        |
| Servicemen            |           |        |                                 |        |
| Laborers              |           |        |                                 |        |
| Unskilled Operators   |           |        |                                 |        |
| Others                |           |        |                                 |        |

9. Volume of gross business during a typical year (Check opposite appropriate figure):

|                 |       |                     |       |
|-----------------|-------|---------------------|-------|
| Under \$25,000  | _____ | 350,000- 399,999    | _____ |
| 25,000- 49,999  | _____ | 400,000- 449,999    | _____ |
| 50,000- 74,999  | _____ | 450,000- 499,999    | _____ |
| 75,000- 99,999  | _____ | 500,000- 599,999    | _____ |
| 100,000-124,999 | _____ | 600,000- 699,999    | _____ |
| 125,000-149,999 | _____ | 700,000- 799,999    | _____ |
| 150,000-174,999 | _____ | 800,000- 899,999    | _____ |
| 175,000-199,999 | _____ | 900,000- 999,999    | _____ |
| 200,000-249,999 | _____ | 1,000,000-1,499,999 | _____ |
| 250,000-299,999 | _____ | 1,500,000-1,999,999 | _____ |
| 300,000-349,999 | _____ | 2,000,000-over      | _____ |

<sup>1</sup>Note that the name of a firm does not always reflect the true nature of the business.



## B. Interview Schedule

CONFIDENTIAL

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS  
LOUISIANA AGRICULTURAL EXPERIMENT STATION  
LOUISIANA STATE UNIVERSITY

(Feed Mills)

Date \_\_\_\_\_

Enumerator \_\_\_\_\_

Name of Firm \_\_\_\_\_

Location (address) \_\_\_\_\_ Parish \_\_\_\_\_

Person Interviewed \_\_\_\_\_

Position with Firm \_\_\_\_\_

1. a. How long has this firm or its predecessor been in business? \_\_\_\_\_

b. Type of ownership: (single proprietorship, partnership, corporation, other) . \_\_\_\_\_

Original \_\_\_\_\_ Now \_\_\_\_\_

Reasons changed \_\_\_\_\_

c. Do you have any problems caused by type of ownership? Specify \_\_\_\_\_

2. a. Have you made any major changes in your physical facilities in the last 10 years? Yes \_\_\_\_\_ No \_\_\_\_\_ Explain \_\_\_\_\_

b. Do you plan to make any major changes in the next 5 years? Yes \_\_\_\_\_ No \_\_\_\_\_ Explain \_\_\_\_\_

3. Have you experienced any problems due to the lack of adequate facilities? (Location, transportation, storage, equipment, size, design and arrangement of plant and amount of automation) Explain \_\_\_\_\_

4. Has zoning affected you in any way? Yes \_\_\_\_\_ No \_\_\_\_\_ Explain \_\_\_\_\_

5. Do you think that additional mechanization would be a profitable investment for you? \_\_\_\_\_

6. How much capital would be required to install the desired equipment? \_\_\_\_\_

7. a. What is the estimated capacity of your feed mill per day on a one shift basis (8 hours per day)? \_\_\_\_\_

b. What is your average production per day? \_\_\_\_\_

8. How much storage capacity do you have for:

|                | Bulk     |        | Sack     |        |
|----------------|----------|--------|----------|--------|
|                | Capacity | % Used | Capacity | % Used |
| Whole grain    | _____    | _____  | _____    | _____  |
| Concentrates   | _____    | _____  | _____    | _____  |
| Processed feed | _____    | _____  | _____    | _____  |

9. Do you have any problems associated with processing and storage? \_\_\_\_\_

10. Is your firm operated jointly with a grain elevator, farm supply business, or other? Explain \_\_\_\_\_

11. Is firm management separate from firm ownership? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, what type of decisions does ownership have to approve? Explain \_\_\_\_\_

12. Are goals, standards or incentives established by your firm to stimulate management's performance? Explain \_\_\_\_\_

13. What government reports, trade journals or other publications do you use for guidance and planning purposes? \_\_\_\_\_

14. Do you have any problems associated with management? \_\_\_\_\_

15. What have been the trends in your business as to:

a. Volume \_\_\_\_\_

b. Sold or used in own operation \_\_\_\_\_

c. Custom mixing \_\_\_\_\_

16. If you custom mix, what ingredients do you sell to the farmer?
- Grain (specify) \_\_\_\_\_ tons.
  - Concentrates \_\_\_\_\_ tons.
  - Other \_\_\_\_\_ tons.
17. a. What percentage of your feed sales (tons) is sold in bulk? \_\_\_\_\_  
 b. Have you noticed any change in bulk buying by farmers during the last few years? Yes \_\_\_\_\_ No \_\_\_\_\_ Explain \_\_\_\_\_  
 c. What changes has bulk buying by farmers made in your operation? \_\_\_\_\_
18. What percentage of your sales are delivered? \_\_\_\_\_
19. What type of animals do you prepare most of your feed for? (Example: broiler feed, hog feed) \_\_\_\_\_  
 Give percent of total feed prepared \_\_\_\_\_
20. Do you sell on credit? Yes \_\_\_\_\_ No \_\_\_\_\_
21. State percentage of feed sold to: (a) Wholesaler \_\_\_\_\_; (b) Retailer \_\_\_\_\_;  
 (c) Farmers \_\_\_\_\_; (d) Own Use \_\_\_\_\_; (e) Others \_\_\_\_\_.
22. What do you do in the way of sales promotion? \_\_\_\_\_
23. Do you have agreements or contracts with producers or feed dealers to supply feed? Explain \_\_\_\_\_
24. Do you ever experience difficulty in finding favorable outlets for your product? \_\_\_\_\_
25. List the raw materials that you most commonly buy?
- |    | Ingredients | Produced locally<br>(Tons or %) | Shipped in<br>(Tons or %) | Location<br>of Supplier |
|----|-------------|---------------------------------|---------------------------|-------------------------|
| 1. | _____       | _____                           | _____                     | _____                   |
| 2. | _____       | _____                           | _____                     | _____                   |
| 3. | _____       | _____                           | _____                     | _____                   |
| 4. | _____       | _____                           | _____                     | _____                   |
| 5. | _____       | _____                           | _____                     | _____                   |
26. What are your purchasing arrangements? (consignment, cash payment, deferred payment) \_\_\_\_\_
27. Do you ever experience difficulty in obtaining supplies of raw products needed to fill anticipated needs? (time, quality, etc.) \_\_\_\_\_
28. What is your total investment? \_\_\_\_\_
- Fixed facilities (resale value) \_\_\_\_\_
    - Land \_\_\_\_\_
    - Building \_\_\_\_\_
    - Furniture, fixtures, vehicular equipment, etc. \_\_\_\_\_
  - Operating inventory (wholesale value) \_\_\_\_\_
    - Inventory of saleable supplies: Average \_\_\_\_\_ Low \_\_\_\_\_ Peak \_\_\_\_\_
29. Is adequate financing a problem in your business? \_\_\_\_\_
30. a. What is the area served by your firm? North \_\_\_\_\_ miles; East \_\_\_\_\_ miles; West \_\_\_\_\_ miles; South \_\_\_\_\_ miles.  
 b. How many feed mills are in and serve this area? \_\_\_\_\_
31. How close is your nearest competitor? \_\_\_\_\_ miles?
32. Is your firm faced with competition from:
- Direct sales from central plants (national known firms)? \_\_\_\_\_
  - Mobile feed mills? \_\_\_\_\_
  - Farmers installing their own grinding and mixing equipment? \_\_\_\_\_
  - Others? \_\_\_\_\_
33. How are prices determined by/for your firm regarding:
- Supplies you buy?
    - From farmers \_\_\_\_\_
    - From other sources \_\_\_\_\_
  - Products you sell?
    - To dealers \_\_\_\_\_
    - To farmers \_\_\_\_\_
- (Independently of competition; follow the lead of a dominant firm; attempt to meet competitors' prices; set price according to costs.)

34. Do any of your expense items represent a problem to your firm? (Labor, grain and concentrates, etc.) \_\_\_\_\_
35. Does labor turnover cause any problems? Explain \_\_\_\_\_
36. Do you have any problems in obtaining, training, or keeping labor? Explain \_\_\_\_\_
37. Do you have any problem related to labor unions? \_\_\_\_\_
38. Number of employees.

| Type                  | Permanent | Additional for Seasonal Work |          |          |          |
|-----------------------|-----------|------------------------------|----------|----------|----------|
|                       |           | 1st Qtr.                     | 2nd Qtr. | 3rd Qtr. | 4th Qtr. |
| Manager or supervisor | _____     | _____                        | _____    | _____    | _____    |
| Office workers:       |           |                              |          |          |          |
| Female                | _____     | _____                        | _____    | _____    | _____    |
| Male                  | _____     | _____                        | _____    | _____    | _____    |
| Laborers              | _____     | _____                        | _____    | _____    | _____    |
| Others (specify)      | _____     | _____                        | _____    | _____    | _____    |

(Specify in cases where female except office workers)

39. What is the percentage of business done during the following periods?

|                         | Percent of Sales |       | Percent of Purchases |       |
|-------------------------|------------------|-------|----------------------|-------|
|                         | \$               | Tons  | \$                   | Tons  |
| January 1 - March 31    | _____            | _____ | _____                | _____ |
| April 1 - June 30       | _____            | _____ | _____                | _____ |
| July 1 - September 30   | _____            | _____ | _____                | _____ |
| October 1 - December 31 | _____            | _____ | _____                | _____ |

40. What have you done in the past to smooth out fluctuations in either sales, purchases and/or processing? \_\_\_\_\_
41. What problems does seasonality of business present for your firm? \_\_\_\_\_
42. What feed mill services do farmers of your community most desire? \_\_\_\_\_
43. Have federal farm programs affected your business appreciably? (Soil bank, acreage, reserve, new grain bill) . Explain \_\_\_\_\_

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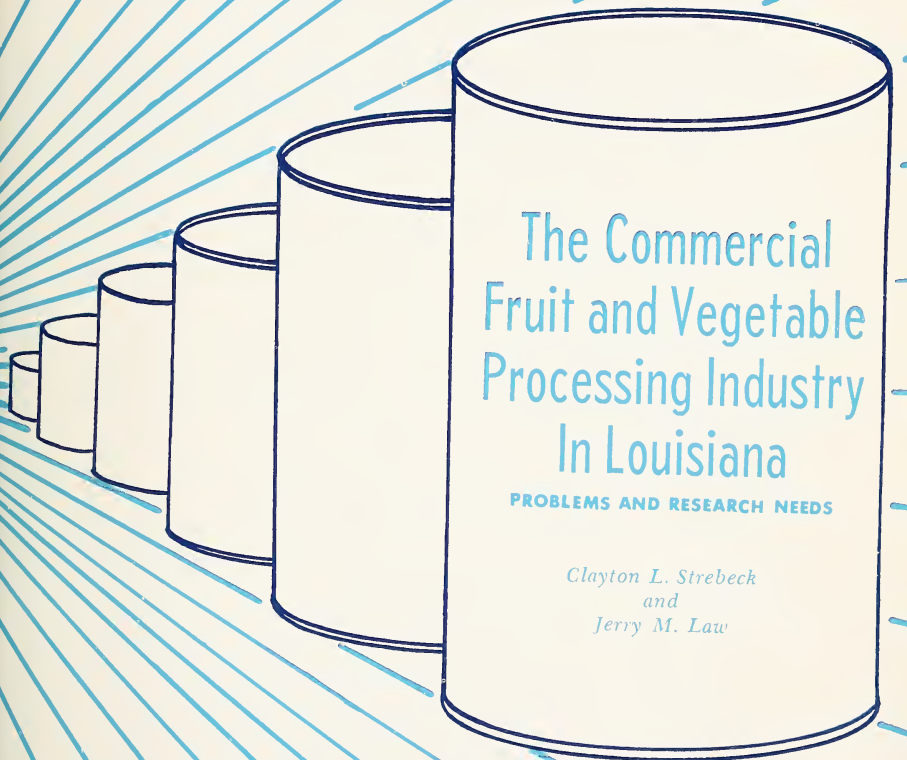
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# The Commercial Fruit and Vegetable Processing Industry In Louisiana

PROBLEMS AND RESEARCH NEEDS

*Clayton L. Strebeck  
and  
Jerry M. Law*

DEPARTMENT OF AGRICULTURAL  
ECONOMICS AND AGRIBUSINESS

LOUISIANA STATE UNIVERSITY AND  
AGRICULTURAL AND MECHANICAL COLLEGE  
AGRICULTURAL EXPERIMENT STATION  
CHARLES W. UPP, DIRECTOR  
IN COOPERATION WITH  
THE SMALL BUSINESS ADMINISTRATION  
WASHINGTON, D.C.

## Foreword

This study of the commercial fruit and vegetable processing industry in Louisiana is one of five agribusiness studies contributing to a project under the general title, "An Economic Analysis of Problems Affecting the Success of Selected Small Agricultural Businesses in Louisiana." The other four phases are concerned with:

1. Retail farm equipment businesses.
2. Feed, seed, and fertilizer supply stores.
3. Local grain elevators.
4. Feed and oil mills.

These agribusinesses have problems peculiar to their close relationship to agriculture and, although they may perform a very important service to farmers and the community, they have been relatively neglected in terms of economic research.

These studies are intended to provide a first look at these important agriculturally oriented small businesses in the state and to specifically recognize the incidence, magnitude, and nature of problems which confront them.

This research project was conducted by the Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, Louisiana State University, and financed in part by the Small Business Administration, Washington, D.C.

Professional personnel engaged in the project include:

- Dr. Fred H. Wiegmann, Professor and Head, Department of Agricultural Economics and Agribusiness, Project Director  
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# The Commercial Fruit and Vegetable Processing Industry in Louisiana

## Problems and Research Needs

Prepared by The Department of Agricultural Economics and Agribusiness,  
THE LOUISIANA STATE UNIVERSITY, under the Small Business  
Administration Management Research Grant Program

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September 1963

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# The Commercial Fruit and Vegetable Processing Industry in Louisiana

## Problems and Research Needs

By CLAYTON L. STREBECK AND JERRY M. LAW

### Introduction

The fruit and vegetable processing industry is an important segment of Louisiana's agriculture. The wholesale value of the products of this industry, at the plants, was almost 19 million dollars for the 1960 season. Processors play a highly significant role in the marketing system for Louisiana fruits and vegetables. They serve to (1) prevent heavy losses to growers when fresh markets are oversupplied, (2) provide a market for produce that is not suitable for fresh markets, and (3) provide outlets for agricultural products in areas where no other marketing facilities are available. In addition, the multiplying effect of economic forces set in motion by this industry in providing employment, utilizing raw materials, encouraging investment, and similar activities contributes in great measure to the economic health of the state each year.<sup>1</sup>

The industry is comprised of relatively small firms. Most are locally owned. While these firms are important to the community and to the agriculture they serve, they have not had the benefit of research directed toward their problems. Fruit and vegetable processors face problems which are peculiar to their close relationship with the agricultural economy. Such problems are complex and increasing in number and size. Hoos and Bain<sup>2</sup> indicate that similar firms in California are experiencing rising costs of operation, fluctuations in annual volume of product, pressure to adopt cost reducing and product improving methods, uncertainty as to unsold inventories, competition for markets, and an undefined profit position. They indicate further that fruit and vegetable processing is a highly speculative business, with a low rate of return relative to some lines of manufacturing.

While such studies serve to suggest the nature of problems that

<sup>1</sup>The multiplier and accelerator effects of these activities are reasonably assured though sometimes difficult to measure precisely.

<sup>2</sup>Hoos, Sidney, and Beatrice M. Bain, "Fruit and Vegetable Canning Industry Market Structure Changing," *California Agriculture*, Volume 14, No. 3, March 1960, p. 2.

might be facing fruit and vegetable processors generally, knowledge of specific problems of Louisiana firms is inadequate. It is in the mutual interest of Louisiana firms and the farming areas they serve that problems be identified and recognized by the management concerned. The lack of such knowledge precludes any attempt at remedy. Once problems are recognized, possible solutions may be apparent, or specific research can be aimed at providing workable solutions.

This report presents findings of a study which was exploratory in nature but not intended as a definitive business analysis. The objectives were to:

1. Identify and classify major problems peculiar to Louisiana fruit and vegetable processors.
2. Evaluate the relative importance of these problems.
3. Identify, where possible, the causal factors underlying these problems.
4. Determine the need for and nature of research that would be helpful in solving certain problems, where the solutions are not apparent from this exploratory study.

## Procedure

At the beginning of the study a questionnaire was mailed to each of the 18 processing plants known to operate in Louisiana during the 1960 season.<sup>3</sup> The questionnaire requested information on the exact nature of business, year of origin, type of ownership, number and class of employees, and volume of business (see Appendix A). The purpose of this information was to provide a basis for (1) determining sampling procedure and (2) designing a more refined and detailed questionnaire (see Appendix B) for use in a later survey by personal interview.

Eleven of the 18 plants completed and returned the mail questionnaire. The information provided by these plants revealed a relatively wide variation in size and age of plants. In addition, the sample included canning plants, freezing plants, and processors of hot sauce and other hot pepper products. In view of this variation and its possible association with business problems, it was considered desirable to include all plants in the study.

The survey by personal interview was initiated and completed during 1961. Except where otherwise indicated, the data used in the analysis apply to the 1960 processing operations in the state.

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<sup>3</sup>The list of plants was obtained from the following publication: Kost, F. J. E. P. Roy, and B. E. Williamson, *Commercial Fruit and Vegetable Canning and Freezing Operations in Louisiana*, D.A.E. Circular No. 276, Louisiana Agricultural Experiment Station, Baton Rouge, Louisiana, November 1960.



# Description of the Commercial Fruit and Vegetable Processing Industry in Louisiana

## Type, Number, and Location of Plants

Commercial fruit and vegetable processing in Louisiana involves three principal types of operation. They are (1) canning, (2) freezing, and (3) processing of hot sauce and other hot pepper products.<sup>4</sup> Many plants engage exclusively in one operation, such as canning. Others operate primarily as canners, freezers, or pepper processors, but engage in at least one of the other activities. For purposes of this study all plants were classified according to the primary type of operation in which they were engaged. The criterion used was the relative value of output resulting from the various types of operations.

Information presented in Table 1 shows that at one time (1953) there were as many as 27 plants in the state. Of these, 24 were classified as canning plants, 1 as a freezing plant, and 2 as processors of hot sauce and other hot pepper products. By 1960 the number of plants had declined gradually to 18. All of the decline occurred among canning plants.

Factors affecting the success of fruit and vegetable processors in the state evidently have been more critical for canning plants than for other types of processors. Competition would seem to be more intense in the canning operation because (1) there is a comparatively large number of canners geographically concentrated in Louisiana and (2) the main product canned by most of the plants is the same, namely sweet potatoes. Other factors affecting the success of these plants will be discussed in later sections of the report.

Of the 18 plants in existence at the time of the study, 14 were classified as canners, 2 as freezers, and 2 as processors of hot sauce and other hot pepper products. One plant (a canner) is located in the northeast corner of the state. The others are concentrated in south central and southeastern Louisiana (Figure 1). Except for 1 plant in the city of New Orleans, all are located within, or in close proximity to, farming areas where some or all of the different kinds of fruits and vegetables used in individual plant operations are produced.

The agricultural service area of a processing plant is defined to include the number of parishes (counties) from which raw product supplies are obtained. Main supply areas for processing plants in the

<sup>4</sup>The processing of hot sauce and other hot pepper products generally involves different types of equipment and a longer time period than either canning or freezing operations.

TABLE 1.—Number of Commercial Fruit and Vegetable Processing Plants in Louisiana, 1948-1962

| Primary type<br>of operation <sup>a</sup> | Year |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                                           | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
| Canning plant <sup>b</sup>                | 23   | 21   | 21   | 21   | c    | 24   | 20   | 19   | 19   | 18   | 17   | 17   | 14   | c    | 16   |
| Freezing plant <sup>c</sup>               | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    |
| Other <sup>d</sup>                        | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |
| Total                                     | 26   | 24   | 24   | 24   | c    | 27   | 23   | 22   | 22   | 22   | 21   | 21   | 18   | e    | 20   |

<sup>a</sup>Several plants engaged in more than one type of operation. However, they are included only in the category constituting the primary type of operation as indicated by the relative value of output of canned products, frozen products, etc.

<sup>b</sup>Data on number of canning plants were obtained from annual statistics on canning operations in Louisiana (see for example Kost, Roy, and Williamson, *Op. Cit.* p. 5). Annual statistics included all plants engaged in canning operations. However, one of these plants was operated primarily as a processor of hot sauce and other hot pepper products and was listed as such in the above table.

<sup>c</sup>Data synthesized from information obtained during the personal interview survey. Data do not include processors who, during some seasons, may set up temporary operations to receive and pack strawberries in bulk for use in other processing plants in making preserves, etc.

<sup>d</sup>Processor of hot sauce and other hot pepper products.

<sup>e</sup>Data not available.

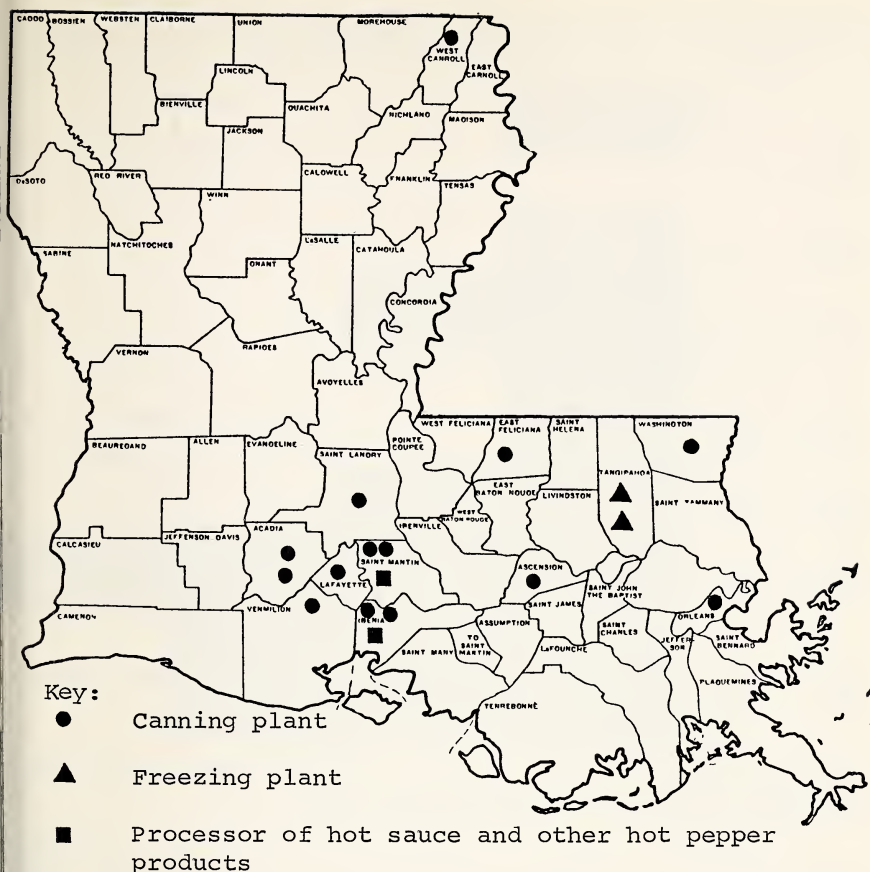


FIGURE 1.—Location of Commercial Fruit and Vegetable Processing Plants Operating in Louisiana, 1960 Season.

state are concentrated largely within 18 parishes in close proximity to the location of the processing plants.<sup>5</sup>

There is considerable overlapping of supply areas among plants. Only two plants relied exclusively on products obtained within the parish in which each was located. Others obtained supplies from two to eight parishes (Table 2). Some of the factors which seem to be associated with the size of service area of a given plant include: (1) the size of the plant, (2) the number of different products packed, (3) the intensity of competition for supplies in a given parish, and (4) the

<sup>5</sup>Seven plants purchased some raw products from out-of-state sources. The amount of such purchases varied from a low of 1 percent to a high of 40 percent. The two freezing plants purchased the highest proportion from out-of-state. Sources of raw product supply included five states in addition to Louisiana.

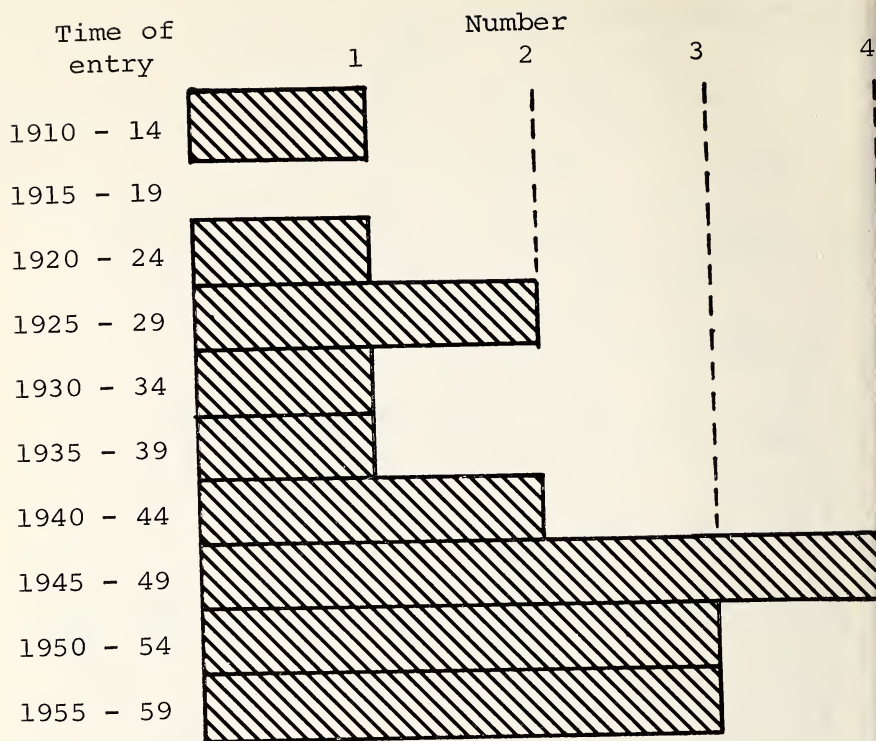


**FIGURE 2.—Number of Existing Louisiana Fruit and Vegetable Processing Plants that Entered Business During Indicated Time Periods.**

total volume of raw product available for processing in different areas

The time period during which the 18 currently existing plants entered business is shown in Figure 2. The oldest existing plant, a processor of hot sauce and hot pepper products, started operation in 1910. Eight existing plants were in business prior to World War II (before 1941). Of the remaining 10 plants, 1 entered in 1945, 2 in 1946, 1 in 1947, 3 in 1953, 2 in 1957, and 1 in 1958.

### **Type of Ownership and Organization**

Three types of ownership are represented in the Louisiana fruit and vegetable processing industry. They are corporations, partnerships, and single proprietorships. Of the 18 existing plants 10 were initially organized as corporations, 6 as partnerships, and 2 as single proprietorships (Table 3). The 10 plants initially organized as corporations were still under this type of ownership in 1960. In addition, 4 plants originally organized as partnerships and 1 as a single proprietorship had change



**TABLE 2.—Number of Parishes in the Service Area of Louisiana Commercial Fruit and Vegetable Processing Plants, 1960 Season**

| Plants   | Parishes in service area<br>of each plant |
|----------|-------------------------------------------|
| (Number) | (Number)                                  |
| 2        | 1                                         |
| 1        | 2                                         |
| 4        | 3                                         |
| 2        | 4                                         |
| 3        | 5                                         |
| 4        | 6                                         |
| 2        | 8                                         |
| Total    | —                                         |

to the corporate form. One of the plants initially organized as a partnership changed to a single proprietorship because of family considerations. Reasons given for plants being changed to corporations were: (1) need for capital, (2) to gain advantages of the corporate status, (3) to reduce liability, and (4) the management became too complex for the non-corporate form of ownership. None of the respondents had plans for changing the type of ownership in the future.

**TABLE 3.—Type of Ownership of Commercial Fruit and Vegetable Processing Plants in Louisiana**

| Type of ownership     | Number of plants |      |
|-----------------------|------------------|------|
|                       | At time of entry | 1960 |
| Corporation           | 10               | 15   |
| Partnership           | 6                | 1    |
| Single proprietorship | 2                | 2    |
| Total                 | 18               | 18   |

Land, buildings, and equipment generally were owned rather than leased. However, some respondents were of the opinion that it would be more economical to lease rather than own some items of equipment because of the savings in overhead cost. This would be particularly true of highly specialized equipment which may not be utilized during the full season of plant operation.

**Management-Ownership Affiliation**

Because of the relatively small size and seasonality of business, most fruit and vegetable processing plant owners generally assume the responsibility of management. However, this was not true in the case of five plants. In each of these cases a manager was hired and the owners exercised their authority only in matters of major importance.

## Resale Value of Plant

Respondents were asked the resale value of their plant including land, buildings, equipment, and all other physical facilities used in the plant operation. The estimated value of the 18 plants totaled \$9,735,000. Estimates for individual plants ranged from \$45,000 to \$2,000,000. More than half of the plants were valued at less than \$500,000. Four were valued at \$1,000,000 or more (Table 4). Differences in value seemed to be associated largely with plant capacity, type of plant, and the number of products that the plant was equipped to process. There appeared to be no consistent relationship between age of plant and estimated resale value.

**TABLE 4.—Estimated Resale Value of Louisiana Commercial Fruit and Vegetable Processing Plants, 1960**

| Resale value of plant<br>(Dollars) | Number of plants |
|------------------------------------|------------------|
| Under 99,999                       | 3                |
| 100,000 - 499,999                  | 8                |
| 500,000 - 999,999                  | 3                |
| 1,000,000 - 1,499,999              | 2                |
| 1,500,000 and over                 | 2                |
| Total                              | 18               |

## Output Capacity of Canning Plants<sup>6</sup>

For comparability the output capacity of canning plants is expressed in terms of the number of standard case equivalents<sup>7</sup> that can be packed in an eight-hour day. The output capacity of the 14 Louisiana canning plants ranged from 500 to 6,000 standard cases. Half of the plants had canning capacities of less than 2,000 standard cases (Table 5).

## Facilities for Raw Product Storage

Most of the Louisiana processors (14) circumvented the use of raw product storage facilities by obtaining supplies at the approximate rate needed for processing. Four canners owned raw product storage facilities either in the form of kilns or warehouses. However, only three of these canners used such facilities for storing raw products for more than a few days. The three canners who held supplies for longer period considered storage facilities to be adequate for their individual operations.

<sup>6</sup>The output capacity of the two freezing plants and the two processors of hot sauce and other hot pepper products is not reported. To do so would reveal confidential information about individual plants.

<sup>7</sup>Standard case = 24 No. 2 cans.

**TABLE 5.—Output Capacity of 14 Louisiana Commercial Canning Plants, 1960**

| Standard cases per eight-hour day | Number of plants |
|-----------------------------------|------------------|
| 1599 or less                      | 3                |
| 1600 - 1999                       | 4                |
| 2000 - 3499                       | 4                |
| 3500 or more                      | 3                |
| Total                             | 14               |

Plants in which hot sauce and other hot pepper products are processed require some type of storage tank since the raw product, after being converted to pulp form, must be held in liquid for several months to age before further processing. Both wooden and cement tanks are used to fulfill this requirement.

### Facilities for Finished Product Storage

All processing plants had some type of facility for the storage of finished products. Cannery and pepper processors owned warehouses. Processors operating freezing plants owned freezer storage facilities. In the case of canning plants the capacity for finished product storage was related directly to the output capacity of the plant (Table 6).<sup>8</sup> In most cases the finished product storage space was considered adequate. Only three processors indicated a need for additional warehouse facilities.

**TABLE 6.—Finished Product Storage Capacity of 14 Louisiana Commercial Canning Plants, by Output Capacity of Plant, 1960**

| Output                              | Plants   | Storage capacity<br>per plant |
|-------------------------------------|----------|-------------------------------|
| (Standard cases per eight-hour day) | (Number) | (Cases)                       |
| 1599 or less                        | 3        | 31,667                        |
| 1600 - 1999                         | 4        | 88,750                        |
| 2000 - 3499                         | 4        | 125,000                       |
| 3500 or more                        | 3        | 300,000                       |

### Changes in Physical Facilities

Half of the Louisiana processors had made no major changes in plant facilities within the past five years. Changes made by other processors during the past five years included (1) the addition of new equipment and machinery and (2) new buildings for warehouse and office space. New machinery and equipment consisted of labeling machines, boilers, and production lines.

<sup>8</sup>The finished product storage capacity of the two freezing plants and the two processors of hot sauce and other hot pepper products is not reported. This would reveal confidential information about individual plants.

Seven processors had plans for changes in plant facilities within the next three years. Planned changes in existing facilities included adding of cement floors to warehouses and repairing of roofs on buildings. Four processors planned to expand output capacity. Plans included purchasing new equipment and machinery, and building new warehouses to store increased volume of finished product. Anticipated expansion rates for the four processors ranged from 1 per cent to 25 per cent over present output capacity.

## Raw Product Procurement

Methods of procuring raw product supplies included (1) grower-processor contracts and (2) open market purchases. Seven processors depended on open market purchases for all raw product supplies. The remaining 11 used grower-processor contracts, but only 5 of them depended on this method exclusively (Table 7).

**TABLE 7.—Methods of Procuring Raw Product Supplies by Louisiana Fruit and Vegetable Processors, 1960**

| Method of procurement        | Number of processors |
|------------------------------|----------------------|
| Grower-processor contracts   | 5                    |
| Open market purchases        | 7                    |
| Combination of above methods | 6                    |
| Total                        | 18                   |

Grower-processor contracts generally called for growers to deliver certain product quantities of designated grade to the plant. The processor in turn agreed to purchase the product at a specified price. Although information was not obtained on this matter, it was apparent that contracts were not uniform within the industry. For example some contracts specified a minimum price which would be exceeded if justified by market conditions at time of harvest. Others did not have this provision.

Grower-processor contracts should provide a useful basis for planning plant operations in advance. This method of procurement provides the processor with greater assurance of obtaining adequate supplies of the variety and quality of raw product desired. However, there were some instances of growers failing to abide fully with contract requirements. Some processors seemed to be reluctant to enforce the terms of contract for fear of creating ill will. In lieu of rigid enforcement it would seem advisable for processors to keep in frequent contact with contract grower throughout the season to maintain good relations and to encourage

<sup>9</sup>For example, they might sell some of their higher grade product on the open market for higher prices.



compliance. Several owners of smaller plants made this contact themselves. Two processors employed field men for this purpose. Duties of the field men were to advise growers about proper varieties, planting dates, fertilizers, insecticides, proper time of harvest, and other practices. But one of their most important functions was to maintain good relations between grower and processor.

It seems likely that some grower-processor contracts could be improved to the mutual satisfaction of both the grower and the processor. Further study of this problem is needed.

Although raw product supplies were obtained mainly from local agricultural service areas, seven processors procured additional supplies from out-of-states sources. One purchased as much as 40 percent from other states. Out-of-state procurements for the other six processors varied from 20 percent to less than 1 percent of their total raw product supplies.

## Finished Products

Louisiana canners packed the equivalent of approximately 2,531,828 standard cases of fruits and vegetables during the 1960 season (Table 8). Sweet potatoes represented more than 84 percent of this volume. Almost 13 percent of the total volume consisted of okra and okra mixes. The remaining 3 percent of the canned pack included green beans, dry beans, and figs. All but one canner packed sweet potatoes. This was the only product packed by eight canners.

**TABLE 8.—Estimated Volume of Output of Louisiana Commercial Fruit and Vegetable Canning Plants, 1960 Season**

| Product             | Standard case equivalents | Percent of total pack |
|---------------------|---------------------------|-----------------------|
| Sweet potatoes      | 2,136,828                 | 84.40                 |
| Okra and okra mixes | 328,635                   | 12.98                 |
| Other               | 66,365                    | 2.62                  |
| Total               | 2,531,828                 | 100.00                |

Major products of freezing plants included sweet potatoes, okra, peas, bell peppers, spinach, broccoli, greens, green beans, squash, and strawberries.

Two processors specialized in making hot sauce and other hot pepper products, including pickled peppers, table sauces, and spices.

The value of all finished products of the Louisiana fruit and vegetable processing industry was estimated to be \$18,969,575 for the 1960 season (Table 9). Of the total value 68 percent was accounted for by canned products, 15 percent by frozen products, and 17 percent by hot sauce and other hot pepper products.

TABLE 9.—Estimated Value of Finished Products of the Louisiana Fruit and Vegetable Processing Industry, 1960 Season

| Form of product | Finished products                                                                              | Estimated value <sup>a</sup><br>(Dollars) | Percent of total value |
|-----------------|------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------|
| Canned          | Sweet potatoes, okra, green beans, dry beans, figs                                             | 12,880,825                                | 67.90                  |
| Frozen          | Sweet potatoes, okra, peas, bell peppers, spinach, broccoli, green beans, squash, strawberries | 2,838,750                                 | 14.97                  |
| Other           | Hot sauce, other table sauces, pickled hot peppers, spices, preserves                          | 3,250,000                                 | 17.13                  |
| Total           | -----                                                                                          | 18,969,575                                | 100.00                 |

<sup>a</sup>Includes the value of specified forms of product packed by all types of plants.

Two processors packed exclusively under the label of buyers of the finished product. One-third of the processors packed from 50 to 95 percent of their output under buyers' labels. Although the other processors did some custom packing, they packed at least 75 percent of their output under their own labels.

**Method of Planning Output.** The planned volume of output of processors was influenced by the outlook for raw product supplies and their volume carry-over stocks of finished goods (if any). Beyond these considerations, some processors planned output on the basis of sales volume during the past year. Several using this method made allowance for a 10 percent increase in sales volume over the previous year. The majority of firms, however, planned output volume on the basis of a tentative agreement, prior to the packing season, with the buyers of the finished product.

**Area of Distribution.** Fruits and vegetables processed in Louisiana are distributed both regionally and nationally. Areas of distribution mentioned most frequently were the southern states and the central and eastern sections of the United States. Less frequently mentioned were the Southwest and the West Coast. Most of the processors indicated that their sales were strongest in the southern states and eastern half of the United States.

**Pricing of Finished Product.** The four processors who were not canners indicated that the main basis for pricing of finished products was a markup over average costs, with due recognition for market conditions and competition.

Canners also indicated cost as the main basis for pricing. However, there was some question as to whether most canners kept adequate records to determine costs accurately. Pricing by two canners, who maintained accurate cost records, seemed to be used as guidelines for pricing by a number of the other firms.

Only 13 processors supplied information on the percentage markup over average costs. Markups indicated by these plants ranged from 5 percent to 40 percent and averaged 20.3 percent.

**Seasonality of Sales.** Twelve processors supplied information on seasonality of sales by quarter periods. One of these processors indicated that all sales were made in the second and third quarters of the year. Sales by the other eleven processors were distributed throughout the year. Although seasonal variation in sales was not large in most cases, sales tended to be lowest during the second quarter and highest during the last.

**Sales Outlets.** Seventeen processors sold through food brokers. Eleven of these used the food broker exclusively while the remaining six sold from 1 to 80 percent of their volume in this manner. Brokerage fees reported by canners ranged from 3 to 5 percent, although most reported 3 percent. Processors other than canners reported brokerage fees ranging from 5 to 8 percent.

Five processors reported selling directly to wholesalers—one exclusively. One firm reported selling a small proportion of its output directly to retailers. Another reported selling some of its finished product to the Federal Government.

**Delivery Facilities.** Facilities for delivering finished products to buyers were owned by 10 processors. However, only 4 of these processors owned all of the delivery facilities they utilized. The other 6 owned delivery facilities, but leased or contracted additional facilities, or used public carriers for transportation of part of their finished product volume. Of the 8 plants owning no delivery facilities, 2 leased all facilities, 2 contracted for delivery, and 4 used public carriers for delivery of finished products.

Some processors expressed the opinion that it was more economical to contract or lease delivery facilities, or utilize public carriers. Their main reasons were: (1) delivery facilities are not utilized continuously and (2) public or private transportation is available when needed. However, processors who used their own facilities for transportation of both raw and finished products were of the opinion that owning was more economical and more convenient. The reason was that transportation facilities were utilized for more jobs and over a longer period of time.

**Sales Promotion.** Most processors in the state sponsored some type of sales promotion program. Half of the processors allocated funds, which ranged from 1 to 3½ percent of their gross dollar sales, to advertising.

Principal advertising media were newspapers and radio. Most processors offer quantity discounts as a means of promoting sales, especially when under competitive pressure. Several allowed discounts to chain stores with the understanding that the stores were to advertise the processor's product.

**Interregional and Interproduct Competition.** High freight rates on out-of-state shipments place Louisiana processors at a competitive disadvantage in many markets outside the southern region. It is a general consensus in the industry that frozen fruits and vegetables have not interfered significantly with the market for canned sweet potatoes. Aside from canned sweet potatoes, however, processors generally feel that frozen fruits and vegetables have taken away part of the market for similar products in the canned form.

## Employment and Labor

**Seasonality of Employment.** Processors in Louisiana generally employ both full-time and part-time labor. Full-time labor is employed largely for operations connected with selling finished products and for plant maintenance. The number of full-time employees averaged 13 for canning plants and 29 for other types of processors (Table 10).

**TABLE 10.—Number of People Employed Full Time in Louisiana Commercial Fruit and Vegetable Processing Plants, 1960<sup>a</sup>**

| Type of plant      | Full-time employees |                                       |
|--------------------|---------------------|---------------------------------------|
|                    | Total number        | Average number per plant <sup>c</sup> |
| Canning            | 151                 | 13                                    |
| Other <sup>b</sup> | 117                 | 29                                    |
| All plants         | 268                 | 18                                    |

<sup>a</sup>Two canning processors were completely closed for eight months of the year and were not included as employers of full-time labor.

<sup>b</sup>Includes two freezing plants and two processors of hot sauce and other hot pepper products.

<sup>c</sup>Averages rounded to whole numbers.

Part-time labor is employed largely to handle seasonal processing operations. Processing generally is much more seasonal in canning plants than in other types. Consequently, the number of part-time employees shows considerably more variation for plants operated totally or largely as canners than for other types of processors (Table 11). Employment of part-time labor is at its lowest point in March and reaches a peak in November. High employment of part-time labor during August through December is for the processing of sweet potatoes—the principal product of the canning industry. Since eight processors only can sweet potatoes, their need for part-time employees is limited to a relatively short period (four or five months) of the year.



TABLE 11.—Number of People Employed Part Time in Louisiana Commercial Fruit and Vegetable Processing Plants, by Months, 1960

| Type of plant      | Month |      |      |      |     |      |       |       |       |       |       |       |
|--------------------|-------|------|------|------|-----|------|-------|-------|-------|-------|-------|-------|
|                    | Jan.  | Feb. | Mar. | Apr. | May | June | July  | Aug.  | Sept. | Oct.  | Nov.  | Dec.  |
| Canning            |       |      |      |      |     |      |       |       |       |       |       |       |
| Plants processing  | 5     | 5    | 3    | 4    | 4   | 7    | 9     | 11    | 14    | 14    | 14    | 11    |
| Employees          | 251   | 251  | 126  | 166  | 166 | 511  | 753   | 1,468 | 2,781 | 2,965 | 2,978 | 2,243 |
| Other <sup>a</sup> |       |      |      |      |     |      |       |       |       |       |       |       |
| Plants processing  | 3     | 3    | 3    | 3    | 4   | 4    | 4     | 4     | 3     | 4     | 4     | 3     |
| Employees          | 285   | 285  | 285  | 285  | 360 | 430  | 580   | 580   | 500   | 560   | 560   | 500   |
| All plants         |       |      |      |      |     |      |       |       |       |       |       |       |
| Plants processing  | 8     | 8    | 6    | 7    | 8   | 11   | 13    | 15    | 17    | 18    | 18    | 14    |
| Employees          | 536   | 536  | 411  | 451  | 526 | 941  | 1,333 | 2,048 | 3,281 | 3,525 | 3,538 | 2,743 |

<sup>a</sup>Includes two freezing plants and two processors of hot sauce and other hot pepper products.

**Labor Turnover.** Labor turnover in the processing industry is relatively high. This tends to be associated with a problem of somewhat poor quality labor. Generally, however, there is an adequate supply of surplus labor for part-time employment in all areas where plants are located. Many employees were farm people who were available for employment during the slack season of farming operations.

Some processors faced the problem of keeping key personnel. Most processing operations are seasonal, and some managers felt it necessary to create off-season jobs for key personnel in order to have them when needed.

**Fringe Benefits or Incentives.** Processors generally indicated that unskilled laborers were provided with no fringe benefits or incentive payments. When they felt that profits were sufficient, some processors offered Christmas bonuses to key personnel such as plant foremen and equipment operators. This was the only type of benefit or incentive indicated by processors.

## Investment Capital

One-third of the processors indicated commercial banks as their major source of investment capital. The length of loans from this source ranged from six months to three years.<sup>10</sup> In most cases the interest rate at commercial banks was 6 percent per annum; however, several processors obtained loans at 5 or 5½ percent. Sources of investment capital for other processors included (1) sale of stocks and (2) loans from individuals. Several processors supplied their own investment capital.

## Operating Capital

Sixteen processors supplied information on sources of operating capital. Ten of these listed commercial banks as the source of all or part of their operating capital. Operating loans from commercial banks were made for periods ranging from three months to one year. Interest rates ranged from 4 to 7 percent per annum, but the most common rate was 6 percent. Warehouse receipts were the normal security requirements for this type of loan. Commercial banks usually followed the practice of making loans not to exceed 70 or 75 percent of the market value of warehouse merchandise.

Other sources of operating capital included (1) the Small Business Administration, (2) can manufacturers, and (3) partners (in the case of partnerships). The length of loans was five years from the Small Business Administration and three to six months from the other two sources. Loans from these sources required the same type of security

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<sup>10</sup>This relatively short period evidently means that loans were primarily for equipment, repairs, etc. rather than for total plant investment.

as commercial banks and were repaid either on a monthly basis or as the merchandise was sold.

Processors generally felt that they had no problem in obtaining either operating or investment loans. Sources and terms of credit were deemed satisfactory.

## Credit to Customers

The greater part of the finished product of Louisiana processors was sold through food brokers to wholesalers and chain stores. There generally was no credit problem involved.

Processors who sold supplies to growers often extended credit until harvest time, with the understanding that the growers would sell raw products to the processor. There generally was no problem of collecting on credit extended to the grower. The processor had the opportunity to deduct the amount of any loan from payments due the grower for raw products delivered.

## Bookkeeping Practices

All processors, except 1, employed a bookkeeper. Of these, 12 employed bookkeepers on a full-time basis and 5 on a part-time basis (Table 12).

Specific information on types of records kept by processors was not ascertained. However, as pointed out earlier, there were indications that records kept by many of the processors would need to be improved in order to provide management with information required for profit-maximizing decisions. It is doubtful that any of the processors maintained cost information that would be required for the preparation of a break-even chart on plant operations.

**TABLE 12.—Number of Louisiana Commercial Fruit and Vegetable Processors Employing Bookkeepers, 1960**

| Bookkeeper employment | Number of processors |
|-----------------------|----------------------|
| Full-time             | 12                   |
| Part-time             | 5                    |
| None                  | 1                    |
| Total                 | 18                   |

## Problems Recognized by Processors

### Raw Products

Half of the processors experienced some difficulty in obtaining enough raw products to fill anticipated needs for the 1960 season. Short supplies were caused in part by poor weather conditions and insect infestations.

Raw product quality during the 1960 season was considered generally good. However, most processors stated that low quality in some seasons seriously limited the rate of output in processing. Excessive trimming necessary on low quality raw products means that trimming lines must be operated at a slower rate. Only one processor indicated having no trouble with this problem.

Some processors complained that during certain seasons high raw product costs resulted in high finished product costs and, in turn, reduced profit margins.

## **Plant Efficiency**

Thirteen processors were of the opinion that job arrangements within the plant could be improved for greater efficiency. At the time of the interview one processor anticipated hiring a firm to conduct a study of job efficiency within his plant. Several indicated that they were continuously trying to find ways of improving job efficiency.

Two-thirds of the processors felt that efficiency could be improved by rearrangement of plant and equipment. Others felt that present arrangements were about as efficient as possible.

Raw product quality was indicated by 14 processors as the most limiting factor in determining rate of output. Many felt that the problem of low product quality could be solved by (1) informing growers about improved methods of production and handling of the product and (2) adopting more stringent buying procedures. Factors listed by other processors as most limiting in determining rate of output included (1) lack of stamina of workers and (2) limited working area.

Eleven processors reported idle time caused by breakdowns in the plant. The amount of time lost through breakdowns ranged from one to five hours per week. Delay in arrival of raw product supplies caused idle time, averaging about one and one-half hours per week, for six processors.

## **Grower-Processor Contracts**

As indicated earlier, 11 processors purchased part or all of their raw product supplies under contract with growers. Seven of these processors complained that growers did not abide fully with contract agreements. The most frequent complaint was that grade delivered was below contract requirements. The fear of creating ill will of growers caused some processors to be reluctant to enforce contracts.

## **Labor**

The supply of labor for part-time employment was generally considered adequate throughout the processing area. However, most pr-



cessors indicated that the quality of part-time labor was somewhat below that desired. Part of this problem may be due to the lack of experience of laborers. A relatively high rate of turnover made it necessary to hire some new and inexperienced laborers from season to season.

### **Seasonality of Business**

One of the key factors affecting the success of the processing business is the length of operating season. Most of the firms in Louisiana process over a relatively short season. However, the fact that short operating seasons resulted in high overhead cost was indicated as a problem by only two processors. Six others associated a short processing season with problems of labor efficiency. Others indicated no particular problem resulting from the seasonality of business.

### **Waste Disposal**

A caustic soda solution is often utilized in the peeling of sweet potatoes for processing. This solution is considered harmful to sewer systems. Processors depending on municipal sewer systems for disposal of waste plant liquids generally must find other means for disposal of caustic soda solutions. This constituted a problem for at least one processor.

### **Demand for Finished Products**

Eleven processors indicated difficulty in finding favorable outlets for their finished products. Thirteen expressed difficulty in moving inventories at profitable prices.

In spite of this, most processors felt that they were able to predict sales volume for their finished products with reasonable accuracy. Only two said they had general difficulty with this problem, and one expressed difficulty only in predicting canned okra sales.

Approximately half of the processors sold some of their volume through government bids. The remainder indicated that they did not participate in government bids for one or more of the following reasons: (1) product specifications too strict, (2) wage and hour law problems, (3) inadequate facilities, (4) all finished products contracted to other firms, (5) too much red tape, (6) purchasing too unstable, and (7) insufficient volume.

### **Problems Requiring Outside Assistance to Solve**

Processors were asked to indicate the problems they felt would require outside assistance to solve. Problems indicated were: (1) increasing supply and improving quality of raw products, (2) financing of new equipment, (3) sales promotion, (4) improving plant efficiency, and (5) initiating programs to encourage improvement in quality of finished products and to promote sales and other activities in the interest of the Louisiana industry.

# Factors Affecting the Profitability of Sweet Potato Canning Plants

A detailed analysis of factors affecting the economic success of all types of Louisiana processors is not available. However, an analysis concerned with sweet potato canning plants is available in a U.S. Department of Agriculture study made in cooperation with the North Carolina and Louisiana Agricultural Experiment Stations.<sup>11</sup> In this study Hammond examined the profitability of sweet potato canning operations under a variety of conditions. Among the variables affecting profitability, the following were found to be important: (1) size of plant, (2) length of operating season, (3) percent trim and peel loss, (4) price of inputs, and (5) price of finished products. A brief synopsis of the results of Hammond's analysis and some of its implications for Louisiana canners is presented below.

Hammond used an economic-engineering approach in estimating the cost of canning sweet potatoes in four model plants of different sizes. The model plants were synthesized to represent techniques which most probably would be included in plants planned for construction in the near future. They represented capacities of 10, 20, 30, and 40 thousand pounds of raw product input per hour of operation. The influence of different lengths of operating season was evaluated over a range of 600 to 1,400 hours per year. The effect of trim and peel loss was evaluated at three different levels, namely, 30, 40, and 50 percent.

**TABLE 13.—Initial Investment Cost of Durable Goods For Four Model Sweet Potato Canning Plants Operating Varying Lengths of Season**

| Length of season<br>(Hours) | Input capacity per hour (Thousand pounds) |         |         |           |
|-----------------------------|-------------------------------------------|---------|---------|-----------|
|                             | 10                                        | 20      | 30      | 40        |
|                             | (Dollars)                                 |         |         |           |
| 600                         | 354,329                                   | 495,407 | 690,588 | 788,700   |
| 800                         | 369,279                                   | 525,307 | 735,439 | 848,500   |
| 1,000                       | 384,229                                   | 555,207 | 780,289 | 908,300   |
| 1,200                       | 399,180                                   | 585,109 | 825,142 | 968,110   |
| 1,400                       | 414,130                                   | 615,009 | 869,992 | 1,027,910 |
| 1,600                       | 429,080                                   | 644,909 | 914,842 | 1,087,710 |

Source: Hammond, Leigh H., *The Feasibility of Expansion in the Sweetpotato Canning Industry in the Southern States*, Marketing Economics Division, United States Department of Agriculture in Cooperation with the North Carolina Agricultural Experiment Station and the Louisiana Agricultural Experiment Station, Marketing Research Report No. 603, May 1963.

<sup>11</sup>Hammond, Leigh H., *The Feasibility of Expansion in the Sweetpotato Canning Industry in the Southern States*, Marketing Economics Division, United States Department of Agriculture in Cooperation with the North Carolina Agricultural Experiment Station and the Louisiana Agricultural Experiment Station, Marketing Research Report No. 603, May 1963.

The initial investment cost for each model plant was computed in relation to length of operating season. The reason for this was that storage space and pallet requirements increase with length of operating season. The initial investment cost of durable goods for each model plant is presented in Table 13.

The estimated cost of operating four model sweet potato canning plants, by length of season and level of trim and peel loss, is shown in Table 14.

**TABLE 14.—The Relationship Between Total Operating Costs, Length of Season, and Percent Trim and Peel Loss in Four Model Sweet Potato Canning Plants**

| Length of season<br>(Hours) | Trim and peel loss (percent) |         |         |
|-----------------------------|------------------------------|---------|---------|
|                             | 30                           | 40      | 50      |
|                             | (Thousand dol./season)       |         |         |
|                             | Plant A <sup>a</sup>         |         |         |
| 600                         | 643.7                        | 590.1   | 536.8   |
| 800                         | 839.9                        | 768.5   | 697.4   |
| 1,000                       | 1,036.1                      | 946.8   | 857.9   |
| 1,200                       | 1,232.3                      | 1,125.1 | 1,018.5 |
| 1,400                       | 1,428.5                      | 1,303.4 | 1,179.0 |
| 1,600                       | 1,624.6                      | 1,481.8 | 1,339.6 |
|                             | Plant B <sup>a</sup>         |         |         |
| 600                         | 1,231.7                      | 1,126.4 | 1,020.4 |
| 800                         | 1,615.2                      | 1,775.0 | 1,333.5 |
| 1,000                       | 1,998.8                      | 1,823.4 | 1,646.7 |
| 1,200                       | 2,382.4                      | 2,171.9 | 1,959.8 |
| 1,400                       | 2,766.0                      | 2,520.4 | 2,273.0 |
| 1,600                       | 3,150.0                      | 2,868.8 | 2,586.0 |
|                             | Plant C <sup>a</sup>         |         |         |
| 600                         | 1,834.4                      | 1,674.9 | 1,514.4 |
| 800                         | 2,408.2                      | 2,195.6 | 1,981.6 |
| 1,000                       | 2,982.1                      | 2,716.3 | 2,448.8 |
| 1,200                       | 3,555.9                      | 3,237.0 | 2,916.0 |
| 1,400                       | 4,129.8                      | 3,757.6 | 3,383.1 |
| 1,600                       | 4,703.6                      | 4,278.3 | 3,850.3 |
|                             | Plant D <sup>a</sup>         |         |         |
| 600                         | 2,428.3                      | 2,217.0 | 2,003.8 |
| 800                         | 3,189.7                      | 2,908.1 | 2,623.8 |
| 1,000                       | 3,951.2                      | 3,599.1 | 3,243.8 |
| 1,200                       | 4,712.6                      | 4,290.2 | 3,863.8 |
| 1,400                       | 5,474.1                      | 4,981.2 | 4,483.8 |
| 1,600                       | 6,235.5                      | 5,672.2 | 5,103.8 |

<sup>a</sup>Capacities of plants A,B,C, and D are respectively 10, 20, 30, and 40 thousand pounds of raw product input per hour.

Source: Hammond, Leigh H., *The Feasibility of Expansion in the Sweetpotato Canning Industry in the Southern States*, Marketing Economics Division, United States Department of Agriculture in Cooperation with the North Carolina Agricultural Experiment Station and the Louisiana Agricultural Experiment Station, Marketing Research Report No. 603, May 1963.

Following the deduction of operating expense (excluding interest and depreciation) the residual revenue was discounted over a 15-year planning horizon<sup>12</sup> to estimate the capital value of each plant. Capital value was estimated in relation to the initial investment cost of the durable goods in each plant. When estimated capital value exceeded investment cost, the plant was considered to have a positive investment value, and under specified conditions, would be a profitable investment.

Each of the four model plants was found to be a profitable investment within the 15-year planning horizon, even when plants operated for relatively short seasons, if trim and peel loss did not exceed 30 percent. With a trim and peel loss of 50 percent, only the plants with capacities of 30 and 40 thousand pounds per hour had a positive investment value within the 15-year horizon, and only these if operated over a 1,400-hour season each year. With the exception of the 10 thousand pound per hour plant operating over a 600-hour season, all four plants showed a positive investment value with a 40 percent trim and peel loss.

A short annual operating season results in a longer number of years before the investment value of a plant becomes positive. For example, a 20 thousand pound per hour plant shows a positive value within nine years when operated 600 hours per year, and within three years when operated over a 1,400-hour season.

Profitability of all plants was quite sensitive to changes in the level of raw and finished product prices. Considerable pressure on profitability resulted when finished product prices were lowered very much under the prevailing level. Likewise, diminished profitability resulted from much increase in the existing level of raw product prices.

In general, Hammond's analysis shows that larger canning plants operate at a marked advantage over smaller plants, even when the latter are operated over a long processing season. For example, a 40 thousand pound capacity plant can be operated profitably under a variety of conditions which prove disastrous for smaller plants.

Although Hammond's findings are especially appropriate for consideration by those anticipating entry, they also provide guides to more profitable operation of existing canning plants.

Information on the operation of existing canning plants in Louisiana is not sufficiently detailed to permit an accurate delineation of problems based on criteria from Hammond's study. However, at least two problems seem to be implied for the information available. One problem has to do with the size of plants. Four of Louisiana's single-product plants canning sweet potatoes were estimated to have raw product input capacities of approximately 10 thousand pounds per hour or less. Three had capacities of approximately 20 thousand pounds. Ham

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<sup>12</sup>Planning horizon refers to the number of years an investor may expect business endeavor to pay back the investment.



mond's study indicates that plants with larger capacities could be operated more profitably. Another problem has to do with the relatively short operating season. All but one of the Louisiana canners indicated operating less than 1,000 hours during the 1960 season. Three of them operated for less than 600 hours.

## Summary

Commercial fruit and vegetable processing in Louisiana involves three principal types of operation. They are (1) canning, (2) freezing, and (3) processing of hot sauce and other hot pepper products. Many plants engage exclusively in one type of operation, such as canning. Others operate primarily as canners, freezers, or pepper processors, but engage in at least one of the other activities. For purposes of this study all plants were classified according to the primary type of operation in which they were engaged. Of 18 plants in existence at the time of the study, 14 were classified as canners, 2 as freezers, and 2 as processors of hot sauce and other hot pepper products.

One processor is located in the northeast corner of the state at Oak Grove, Louisiana. All others are concentrated in south central and south-eastern Louisiana. Except for one plant in New Orleans all are located within or in close proximity to areas where products used in processing are produced.

The oldest of these processors started operation in 1910. Eight were in business prior to World War II. Of the remaining 10, 1 entered business in 1945, 2 in 1946, 1 in 1947, 3 in 1953, 2 in 1957, and 1 in 1958. At one time (1953) there were as many as 27 processing plants in the state. The decline to the present 18 has occurred among plants operated as canners. Factors affecting the success of fruit and vegetable processors evidently have been more critical for canners than for other types.

At the time of the study 15 plants were organized as corporations, 1 as a partnership, and 2 as a single proprietorship. Only 10 of the plants were originally organized as corporations. Five others changed to the corporate form for one or more of the following reasons: (1) need for capital, (2) to gain advantages of the corporate status, (3) to reduce liability, and (4) the management became too complex for the non-corporate form of ownership. In most cases the owners assumed management responsibilities.

Land, buildings, and equipment generally were owned rather than leased. Estimated resale value of all plants, including land, buildings, equipment, and other facilities, totaled \$9,735,000. Estimates for individual plants ranged from \$45,000 to \$2,000,000, with more than half valued at less than \$500,000. Differences in value seemed to be asso-

ciated largely with plant capacity, type of plant, and the number of products for which the plant was equipped to pack. There appeared to be no consistent relationship between age of plant and estimated resale value.

Output capacity of the 14 canning plants ranged from 500 to 6,000 standard cases (24 No. 2 cans) per eight-hour day. Half of the plants had canning capacities of less than 2,000 standard cases.

Louisiana canners packed the equivalent of approximately 2,531,828 standard cases of fruits and vegetables during the 1960 season. Sweet potatoes represented more than 84 percent of this volume. Almost 13 percent consisted of okra and okra mixes. The remaining 3 percent of the canned pack included green beans, dry beans, and figs. All but one canner packed sweet potatoes, and this was the only product packed by eight canners.

Major products of freezing plants included sweet potatoes, bell peppers, spinach, greens, green beans, squash, and strawberries.

Two processors specialized in the making of hot sauce and other hot pepper products, including pickled peppers, table sauces, and spices.

Fruits and vegetables processed in Louisiana are distributed both regionally and nationally. Most important areas, however, were the southern states and the central and eastern sections of the United States. Other areas included the Southwest and the West Coast.

Half the processors experienced some difficulty in obtaining enough raw products to fill anticipated needs for the 1960 season. Raw product quality during 1960 was considered generally good. However, most stated that low quality in some seasons seriously limited the rate of output in processing. Excessive trimming and sorting necessary on low quality raw products means that trimming lines must be operated at a slower rate.

Some processors complained that during certain seasons, high raw product costs resulted in high finished product costs and, in turn, reduced profit margins.

Thirteen processors were of the opinion that job arrangements within their plants could be improved for greater efficiency. Twelve felt that the efficiency of their operations could be improved by rearrangement of plant and equipment.

Idle time caused by breakdowns ranged from one to five hours per week in 11 plants. Delay in arrival of raw product supplies caused idle time, averaging about one and one-half hours per week, for 6 processors.

Seven processors who purchased raw product supplies under grower processor contracts complained that growers did not abide fully with contract requirements, especially grade specifications. There appeared to

be some reluctance to enforce provisions of the contract for fear of creating ill will of growers.

Although the supply of part-time labor for processing operations was generally considered adequate, most processors indicated that the quality of such labor was somewhat below that desired. A relatively high rate of turnover made it necessary to hire some new laborers from season to season. Hence, the problem may be caused partly by lack of experience of new laborers.

Difficulty in moving inventories at profitable prices was a problem for 13 processors. Eleven expressed difficulty in finding favorable outlets. In spite of this, most processors felt that they were able to predict sales volume for their finished products with reasonable accuracy.

Half of the processors indicated that they did not seek to sell finished products under government bids for one or more of the following reasons: (1) product specifications are too strict, (2) wage and hour law problems, (3) inadequate facilities, (4) all products contracted to other firms, and (5) insufficient volume.

Problems which processors felt they needed outside assistance in solving included: (1) increasing supply and improving quality of raw products, (2) financing of new equipment, (3) improving plant efficiency, and (4) initiating programs to encourage improvement in quality of finished products and to promote sales and other activities in the interest of the Louisiana industry.

## Recommendations

Some of the problems faced by Louisiana fruit and vegetable processors fall within the area of business management and planning. Major deterrents to the most profitable operation of some plants appear to be short operating seasons and relatively small plant capacities. Owners of these plants need to be made aware of the importance of extending the length of the processing season and increasing plant capacity if they are to survive and realize their full profit potential. More accurate and detailed accounting procedures on all phases of plant operation are needed to provide management with information necessary for determining most profitable product combinations and levels of output.

It would be advisable for more processors to consider employment of field men to maintain contact with growers. Field men would serve to encourage (1) the use of better farm management practices for the production of higher quality raw products and (2) compliance with contract agreements.

The answers to a number of problems revealed by the study will depend upon further research. Additional research is needed to determine: (1) the best contractual arrangement between processors and

growers of raw product supplies, (2) the advantages and disadvantages of various accounting systems, (3) the optimum degree and type of diversification of processing operations, (4) the need for special training schools and fringe benefits to acquire competent labor, (5) the advantages and disadvantages of storing raw products for processing, (6) the optimum number, size, and location of different types of processing plants in relation to raw product supplies, transportation costs, and demand for finished products, (7) the advantages of advertising and other sales promotion activities, (8) the need for improvement of finished product quality, (9) the effects of grade labeling of finished products, (10) means of improving efficiency within existing plants, especially those involving multiproduct operations, and (11) the advantages and disadvantages of leasing different types of equipment.



# Appendix

## A. Mail Questionnaire

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### DEPARTMENT OF AGRICULTURAL ECONOMICS LOUISIANA AGRICULTURAL EXPERIMENT STATION LOUISIANA STATE UNIVERSITY

1. Name of Firm \_\_\_\_\_  
 \_\_\_\_\_  
 (Address) (Town or City) (Parish)
2. What is the nature of your business?<sup>1</sup> (For example, feed, seed and fertilizer retail store, feed mixing, sawmill, grain elevator, canning plant, etc.) \_\_\_\_\_
3. How long has this firm or its predecessor been in business? \_\_\_\_\_
4. Present type of ownership (Check one):  
 Private \_\_\_\_\_ Cooperative \_\_\_\_\_  
 Partnership \_\_\_\_\_ Corporation \_\_\_\_\_  
 Other (Specify) \_\_\_\_\_
5. Type of physical organization (Check one):  
 Single plant \_\_\_\_\_ One of two or more in the state \_\_\_\_\_  
 Part of national chain \_\_\_\_\_ Other (Specify) \_\_\_\_\_
6. (a) Size of service area for this plant (Fill in blanks below):  
 North \_\_\_\_\_ miles South \_\_\_\_\_ miles  
 East \_\_\_\_\_ miles West \_\_\_\_\_ miles  
 (b) Number of parishes served \_\_\_\_\_
7. What is the estimated replacement value of your facility? \_\_\_\_\_
8. Number of employees (Fill in appropriate blanks): \_\_\_\_\_

| Type                  | Permanent |        | Additional<br>for Seasonal Work |        |
|-----------------------|-----------|--------|---------------------------------|--------|
|                       | Male      | Female | Male                            | Female |
| Manager               |           |        |                                 |        |
| Office Workers        |           |        |                                 |        |
| Field Representatives |           |        |                                 |        |
| Servicemen            |           |        |                                 |        |
| Laborers              |           |        |                                 |        |
| Unskilled Operators   |           |        |                                 |        |
| Others                |           |        |                                 |        |

9. Volume of gross business during a typical year (Check opposite appropriate figure):  

|                 |       |                     |       |
|-----------------|-------|---------------------|-------|
| Under \$25,000  | _____ | 350,000- 399,999    | _____ |
| 25,000- 49,999  | _____ | 400,000- 449,999    | _____ |
| 50,000- 74,999  | _____ | 450,000- 499,999    | _____ |
| 75,000- 99,999  | _____ | 500,000- 599,999    | _____ |
| 100,000-124,999 | _____ | 600,000- 699,999    | _____ |
| 125,000-149,999 | _____ | 700,000- 799,999    | _____ |
| 150,000-174,999 | _____ | 800,000- 899,999    | _____ |
| 175,000-199,999 | _____ | 900,000- 999,999    | _____ |
| 200,000-249,999 | _____ | 1,000,000-1,499,999 | _____ |
| 250,000-299,999 | _____ | 1,500,000-1,999,999 | _____ |
| 300,000-349,999 | _____ | 2,000,000-over      | _____ |

<sup>1</sup>Note that the name of a firm does not always reflect the true nature of the business.

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## B. Interview Schedule

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#### DEPARTMENT OF AGRICULTURAL ECONOMICS LOUISIANA AGRICULTURAL EXPERIMENT STATION LOUISIANA STATE UNIVERSITY

#### Small Business Study (Food Canning, Packing, and Processing Plants)

Enumerator \_\_\_\_\_ Date \_\_\_\_\_

1. Name of firm \_\_\_\_\_

(Address)

(Town or City)

(Parish)

2. Name and title of person supplying data \_\_\_\_\_

3. Date plant started operations \_\_\_\_\_

4. Recent years plant did not operate \_\_\_\_\_

Reasons: \_\_\_\_\_

5. a. Type of ownership: Originally Now

Single proprietorship \_\_\_\_\_

Partnership \_\_\_\_\_

Corporation \_\_\_\_\_

Other \_\_\_\_\_

b. If type of ownership differs now from originally, why was it changed? (check)

1. Need for more capital \_\_\_\_\_

2. Personnel changes \_\_\_\_\_

3. For tax benefits \_\_\_\_\_

4. To reduce liability \_\_\_\_\_

5. Family consideration \_\_\_\_\_

6. Management got complex \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

c. Are you planning to change the type of legal ownership now or later?

Yes \_\_\_\_\_. No \_\_\_\_\_. If yes, why \_\_\_\_\_

d. Has your firm been involved in any mergers? Yes \_\_\_\_\_. No \_\_\_\_\_

Explain \_\_\_\_\_

6. Do you lease or own the following? (Ownership does not require full equity.)

Give percent.

Lease

Own

Reasons

Land \_\_\_\_\_

Buildings \_\_\_\_\_

Equipment \_\_\_\_\_

7. a. Is this firm affiliated through ownership or management with other businesses

in your service area? Yes \_\_\_\_\_. No \_\_\_\_\_. If yes, give number, types, and

location.

Number \_\_\_\_\_ Types and location \_\_\_\_\_

b. Diagram and give percent relative to business.

8. Is firm management separate from firm ownership? Yes \_\_\_\_\_. No \_\_\_\_\_

Explain \_\_\_\_\_

9. Are goals, standards or incentives established in your firm to stimulate management performance? \_\_\_\_\_ Explain \_\_\_\_\_
10. What is your total investment? (Resale value) \_\_\_\_\_  
Inventory of salable supplies and equipment? (Resale value) \_\_\_\_\_  
Average \_\_\_\_\_ Low \_\_\_\_\_ Peak \_\_\_\_\_
11. Plant capacity:
  1. Number of standard cases per 8-hour day \_\_\_\_\_
  2. a. Kind of facilities for raw product storage \_\_\_\_\_  
b. Capacity of raw product storage facilities (bu.) \_\_\_\_\_  
c. Length of time raw product normally held in storage \_\_\_\_\_
  3. a. Facilities for finished product storage \_\_\_\_\_  
b. Capacity for finished product storage \_\_\_\_\_
  4. Have you made any major changes in your physical facilities in the last 5 years? Yes \_\_\_\_\_. No \_\_\_\_\_. Explain \_\_\_\_\_
  5. Anticipated changes in business during next 3 years \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
12. Processing in same plant other than canning:
  1. Type \_\_\_\_\_
  2. Volume by commodities \_\_\_\_\_
  3. Seasons of operations \_\_\_\_\_
  4. Relationships to canning operations \_\_\_\_\_
13. a. Has zoning affected you in any way? Yes \_\_\_\_\_. No \_\_\_\_\_.  
Explain \_\_\_\_\_  
b. Do you foresee any zoning problems? Yes \_\_\_\_\_. No \_\_\_\_\_.  
Explain \_\_\_\_\_
14. How many parishes are in your agricultural service area?  
Now \_\_\_\_\_ 10 years ago \_\_\_\_\_
15. Transportation of raw materials:
  1. Percent hauled by canner \_\_\_\_\_
  2. Percent hauled by grower \_\_\_\_\_
  3. Percent hauled by \_\_\_\_\_
  4. Average miles hauled \_\_\_\_\_
  5. Maximum miles hauled \_\_\_\_\_
16. Aids rendered contract growers:
  1. Percent seed furnished \_\_\_\_\_
  2. Percent fertilizer furnished \_\_\_\_\_
  3. Percent insecticide furnished \_\_\_\_\_
  4. Technical advice \_\_\_\_\_
17. How does the canner control:
  1. Variety \_\_\_\_\_
  2. Quality \_\_\_\_\_
  3. Planting time \_\_\_\_\_
  4. Harvesting time \_\_\_\_\_
  5. Other \_\_\_\_\_
18. Varieties planted (Percent)
  1. Porto Rico \_\_\_\_\_
  2. Goldrush \_\_\_\_\_
  3. Acadian \_\_\_\_\_
  4. Other \_\_\_\_\_
19. Are cultural practices and fertilizer recommendations of county agents and Agricultural Extension Service followed? \_\_\_\_\_  
\_\_\_\_\_

20. Pounds raw materials purchased (typically)
1. Contract growers \_\_\_\_\_
  2. Other growers \_\_\_\_\_
21. Percent raw material wasted \_\_\_\_\_
22. Purchase price per bu.:
1. Contract growers \_\_\_\_\_
  2. Other growers \_\_\_\_\_
23. Cannery crop acreage:
1. Contract \_\_\_\_\_
  2. Other \_\_\_\_\_
24. Percent out-of-state purchases: \_\_\_\_\_
25. Percent purchases at:
1. Plant \_\_\_\_\_
  2. Field \_\_\_\_\_
  3. Other \_\_\_\_\_
26. Seasonality of employment (1960)

| Month | Product | Full-time number | Average number | No. at peak | Average no. days operated | % Farm labor | Average no. for season | No. at peak |
|-------|---------|------------------|----------------|-------------|---------------------------|--------------|------------------------|-------------|
| Jan.  |         |                  |                |             |                           |              |                        |             |
| Feb.  |         |                  |                |             |                           |              |                        |             |
| Mar.  |         |                  |                |             |                           |              |                        |             |
| Apr.  |         |                  |                |             |                           |              |                        |             |
| May   |         |                  |                |             |                           |              |                        |             |
| June  |         |                  |                |             |                           |              |                        |             |
| July  |         |                  |                |             |                           |              |                        |             |
| Aug.  |         |                  |                |             |                           |              |                        |             |
| Sept. |         |                  |                |             |                           |              |                        |             |
| Oct.  |         |                  |                |             |                           |              |                        |             |
| Nov.  |         |                  |                |             |                           |              |                        |             |
| Dec.  |         |                  |                |             |                           |              |                        |             |

27. Sources of capital used by the firm:

a. Investment

| Source:          | Fraction of total | Length of loan | Frequency of payment | Interest rate | Security required |
|------------------|-------------------|----------------|----------------------|---------------|-------------------|
| Commercial banks | _____             | _____          | _____                | _____         | _____             |
| Private sources  | _____             | _____          | _____                | _____         | _____             |
| _____            | _____             | _____          | _____                | _____         | _____             |
|                  | (100%)            |                |                      |               |                   |

b. Operating

| Source:          | Fraction of total | Length of loan | Frequency of payment | Interest rate | Security required |
|------------------|-------------------|----------------|----------------------|---------------|-------------------|
| Commercial banks | _____             | _____          | _____                | _____         | _____             |
| Private sources  | _____             | _____          | _____                | _____         | _____             |
| _____            | _____             | _____          | _____                | _____         | _____             |
|                  | (100%)            |                |                      |               |                   |



28. Does your firm employ a { part-time bookkeeper? Yes\_\_\_\_. No\_\_\_\_.  
full-time bookkeeper? Yes\_\_\_\_. No\_\_\_\_.

29. Finished product:

1. Type and size containers \_\_\_\_\_

2. No. of standard cases filled (1960)\_\_\_\_\_ (1950)\_\_\_\_\_ (1940)\_\_\_\_\_

3. Value of total output (1960)\_\_\_\_\_ (1950)\_\_\_\_\_ (1940)\_\_\_\_\_

4. How transported:

a. Percent by rail \_\_\_\_\_

b. Percent by truck \_\_\_\_\_

c. Percent by water \_\_\_\_\_

30. Indicate the proportion of sales and percent of goods delivered to/through the following outlets:

Percent  
of sales

Percent of total for each  
outlet that is delivered

a. Direct

Consumer/producer \_\_\_\_\_ (100%)

Retailer \_\_\_\_\_ (100%)

Wholesaler \_\_\_\_\_ (100%)

Government \_\_\_\_\_ (100%)

Processor/mfg. \_\_\_\_\_ (100%)

Other \_\_\_\_\_ (100%)

b. Brokers \_\_\_\_\_ (100%)

(100%)

c. What has been your average brokerage fee during the past 5 years? \_\_\_\_\_

31. Percent of delivery facilities (1) Owned \_\_\_\_\_ (2) Leased \_\_\_\_\_

(3) Contracted \_\_\_\_\_ Explain \_\_\_\_\_

32. What percent of your gross annual sales is allocated to advertising? \_\_\_\_\_ percent. (Excluding check-offs, mandatory deductions.)

33. What do you do in the way of sales promotion? \_\_\_\_\_

34. What percent of your output carries your label? \_\_\_\_\_

35. What percent of your business is done during the following periods:

Percent of sales

Percent of purchases

(delivered and paid for)

(raw product)

Jan. 1-Mar. 31 \_\_\_\_\_

Apr. 1-June 30 \_\_\_\_\_

July 1-Sept. 30 \_\_\_\_\_

Oct. 1-Dec. 31 \_\_\_\_\_

36. a. What have you done in the past to smooth out fluctuations in either sales, purchases, and/or processing? \_\_\_\_\_

b. Plan to do in the future \_\_\_\_\_

37. At what times are sales determined? \_\_\_\_\_

38. a. What is the area of distribution of your finished product? \_\_\_\_\_

b. Has the area changed during the operation of your plant? Yes \_\_\_\_\_.

No \_\_\_\_\_. How \_\_\_\_\_

39. How are prices determined by/for your firm regarding:

Supplies you buy \_\_\_\_\_

Products you sell \_\_\_\_\_

(Independently of competitors; follow the lead of a dominant firm; attempt to meet competitors' prices; set prices according to cost; by agreement before the season.)

40. a. With your present volume, what percent markup must you average to break even? \_\_\_\_\_  
 b. What dollar volume must you average to break even with the markup you try to obtain? \_\_\_\_\_ dollar volume and/or \_\_\_\_\_ unit volume.
41. What are your ideas about the following as they affect the canning industry in Louisiana:
1. Grower education in production and handling.
  2. Improvement in processing methods.
  3. Packaging.
  4. Reports on crop conditions.
  5. Grade labeling.
  6. Competition from other areas, and from frozen and fresh market.
42. What are the most important problems faced by processors?

**A. PLANT EFFICIENCY:**

Do you feel that job arrangements in your plant are as good as they could be, or do you feel that careful study of each job performed might show ways of increasing efficiency within the plant? \_\_\_\_\_

What about the arrangement of the plant and the equipment: Could it be improved? \_\_\_\_\_

What is the most limiting factor in determining your rate of output per hour? \_\_\_\_\_

Is there anything that could be done about this?  
 Yes \_\_\_\_\_. No \_\_\_\_\_. Explain how \_\_\_\_\_

Idle time through breakdowns? (hours per week) \_\_\_\_\_

Idle time due to other factors? (hours per week) \_\_\_\_\_

**B. WHAT ABOUT DEMAND CONDITIONS FOR YOUR PRODUCT?**

Is it always stable, or is there much instability from time to time? \_\_\_\_\_

Is demand for your product predictable or is it relatively uncertain for a season's stock? \_\_\_\_\_

Do you ever encounter difficulty in moving out inventory at profitable prices? \_\_\_\_\_

Do you ever experience difficulty in finding favorable outlets for your product? \_\_\_\_\_

Do you participate in bids for government and institutional buying? Why Or why not? \_\_\_\_\_

**C. WHAT ABOUT SUPPLY CONDITIONS?**

Do you ever experience difficulty in obtaining supplies of raw product needed to fill anticipated needs? \_\_\_\_\_

What about quality of raw product? \_\_\_\_\_

What about prices of raw products—can you obtain what you need at cost which will allow normal profits? \_\_\_\_\_

Do you have any raw product price problems? \_\_\_\_\_

D. WHAT ABOUT LABOR PROBLEMS?

Are they always available or do you sometimes have difficulty in finding enough labor? \_\_\_\_\_

Are they as efficient as you would like them to be? Yes\_\_\_\_\_. No\_\_\_\_\_.

What about plant managers? (Efficiency, etc.) \_\_\_\_\_

E. SEASONALITY:

Does the short and interrupted harvest season for sweet potatoes pose any problems for your plant? Yes\_\_\_\_\_. No\_\_\_\_\_. If yes, in what way? \_\_\_\_\_

F. WHAT ABOUT GROWER-PROCESSOR CONTRACTS?

Do growers always abide by the conditions of the contract?

Yes\_\_\_\_\_. No\_\_\_\_\_.

Are there any problems concerning the grower-processor contract arrangements? \_\_\_\_\_

G. OTHER PROBLEMS?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

43. Which of these problems do you feel that you will be able to solve yourself?  
Which ones do you feel it would be necessary to have outside assistance to solve?

A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_  
D. \_\_\_\_\_  
E. \_\_\_\_\_  
F. \_\_\_\_\_  
G. \_\_\_\_\_

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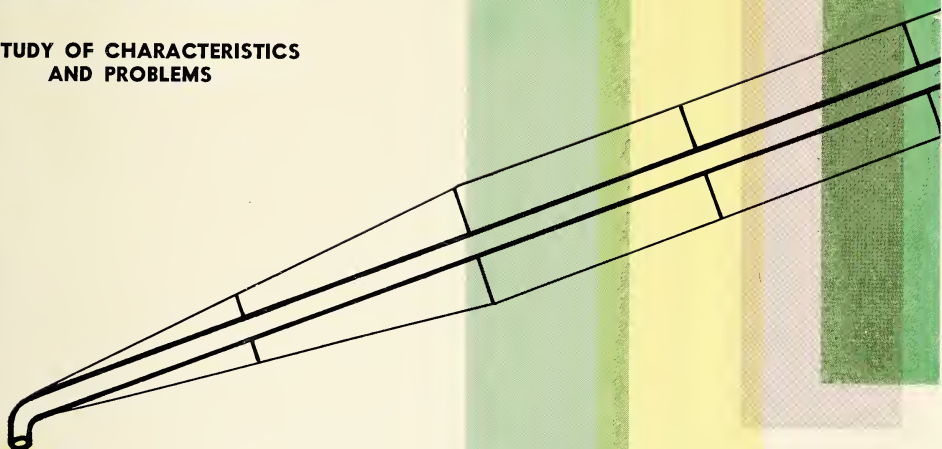
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THE LOCAL

# GRAIN ELEVATOR

BUSINESS IN LOUISIANA

A STUDY OF CHARACTERISTICS  
AND PROBLEMS



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THE SMALL BUSINESS ADMINISTRATION  
WASHINGTON, D.C.

## Foreword

This study of the local grain elevator business in Louisiana is one of five agribusiness studies contributing to a project under the general title, "An Economic Analysis of Problems Affecting the Success of Selected Small Agricultural Businesses in Louisiana." The other four phases are concerned with:

1. Feed, seed, and fertilizer supply stores.
2. Retail farm equipment.
3. Feed mills.
4. Local agricultural canning, packing, and processing plants.

These agribusinesses have problems peculiar to their close relationship to agriculture and, although they perform a very important service to farmers and the community, they have been relatively neglected in terms of economic research.

These studies are intended to provide a first look at these important agriculturally oriented small businesses in the state and to specifically recognize the incidence, magnitude, and nature of problems which confront them.

This research project was conducted by the Department of Agricultural Economics and Agribusiness, Louisiana Agricultural Experiment Station, Louisiana State University, and financed in part by the Small Business Administration, Washington, D.C.

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# The Local Grain Elevator Business In Louisiana

## A Study of Characteristics and Problems

Prepared by the Department of Agricultural  
Economics and Agribusiness, The Louisiana  
Agricultural Experiment Station, LOUISIANA  
STATE UNIVERSITY, under the Small Business  
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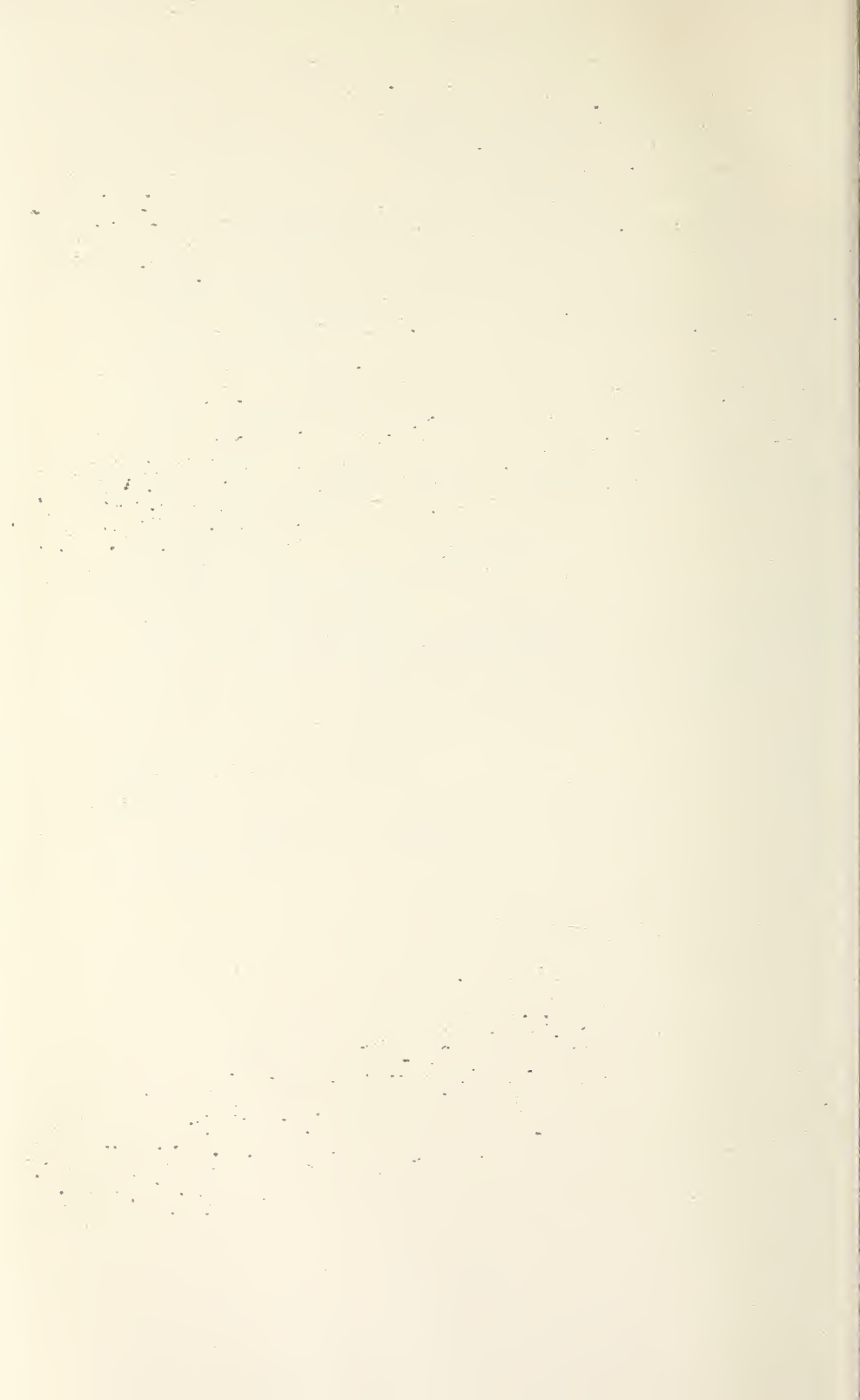
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# The Local Grain Elevator Business In Louisiana

## A Study of Characteristics and Problems

By HARLON D. TRAYLOR AND B. E. WILLIAMSON<sup>1</sup>

### Introduction

Local grain elevators, a relatively new development in Louisiana agriculture, are now an integral part of the economic structure of many communities in the state. Nearly \$10 million of grain was purchased from farmers by the 29 local grain elevators in the state in 1960 (Figure 1).<sup>2</sup> Of the 29, 24 had been established since 1954 and 7 since 1958. With few exceptions such firms are small independent businesses.

The fast rate of growth in the industry indicates that very few problems have become acute to local grain elevator operations in Louisiana. Moreover, to the knowledge of the writers, there had been no cases of bankruptcy in this type of business in the state as of 1960. Many problems do exist in the industry, however, and they are expected to become more acute as competition for available grain becomes keener.

There have been a number of studies of local grain elevator operations in the older grain producing areas of the nation. A selected bibliography of reports on such studies follows the Appendix of this report. These studies are useful in providing information on basic patterns of local grain elevator operations. In appraising this industry in Louisiana and other parts of the South, substantial deviations from the basic pattern exist due to regional differences. Important among such deviations are differences in the season of operations. Very little published material exists on local grain elevator operations in the South.

Since 1960 it has been reported that seven new local grain elevators have been constructed or are in the process of construction in the state. They are not included in this analysis. It should also be noted that certain oil mills, feed mills, and other operations are at times substantial buyers of farmers' grain and are somewhat competitive with local grain elevators. Their pattern of operation is, however, quite dif-

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<sup>2</sup>The names and addresses of the 29 firms appear in Appendix A.

FIGURE 1.—Location of Local Grain Elevators in Louisiana, 1960.



ferent from that of local grain elevators and they were also omitted in the present analysis.<sup>3</sup>

## Purpose of Study

This report is presented for consideration and study by all individuals concerned with identifying and solving problems associated with the operation of local grain elevators. Emphasis is on grain elevator operations. However, farmers, manufacturers, merchants, bankers, government officials, and others interested in the economic development of an area will find the report useful.

Specifically the report has the objectives of (1) determining selected characteristics of local grain elevators in Louisiana and 2) identifying and, where possible, suggesting solutions to problems in the industry.

<sup>3</sup>While feed and oil mills were omitted from the survey, a few elevators operated under a parent company name such as feed and oil mills. When merchandising grain rather than processing it, was the primary activity of the facility involved, the operation was included in the survey of local grain elevators.

## Method of Study

A list of local grain elevators in Louisiana was developed through an examination of telephone directories and through contact with various professional agricultural workers. A short mail questionnaire was then sent to each firm on this list to determine the real nature of the business with the expectation that an efficient sample of firms to study could be drawn. A copy of the mail questionnaire appears in Appendix B.

Thirteen local grain elevators and several other handlers of farmers' grain, such as oil mills, feed mills, terminal elevators, rice driers, rice mills, and operators specializing in storage of government-owned grain responded. A more complete list of local grain elevators in Louisiana was determined by consulting three local grain elevator operators who were among the leaders in the industry.

These three operators also were interviewed in depth about their operations, other local grain elevator operations in Louisiana, and the problems of such operations. A more detailed questionnaire was then prepared to obtain information from other elevator operators by personal interview. This questionnaire, or interview schedule, appears in Appendix C. In all, the operations of 15 of the 29 local grain elevators were studied. This included the 3 case studies and 12 survey interviews. In addition, two officers of the Mid-South Grain Shippers' Association were interviewed concerning problems in the industry.

## Selected Characteristics

Basically, local grain elevator operators consolidate small lots of grain from farmers into large truckload or carload lots. In this process of assembling, operators often buy, sell, dry, clean, blend, store, transport, and otherwise condition grain for sale to terminal grain merchants, oil millers, feed millers, and others. The sections which follow describe this operation in more detail and make certain comparisons with local elevator operations in the North Central region of the United States.

## Ownership and Management

Legal ownership of the 12 survey elevators consisted of 6 corporations, 5 partnerships, and 1 individual proprietorship. Capital requirements probably caused a tendency toward multiple ownership. None of the firms planned to change the type of ownership under which they were operating at the time of the survey.

All the firms owned their plants and all except three firms owned the land upon which the elevator was located. These three leased railroad property which was not for sale. Railroads did not require grain to be shipped by rail as a condition of the lease. In fact one firm, which

leased land for the elevator location from a railroad, shipped almost entirely by truck. No problems were reported by the elevators concerning the length and other terms of such leases. Desirable location of the leased property was among the reasons for leasing.

In 8 of the 12 firms the managers were also either part owners or part of the owners' families. In these cases management ran the business with a relatively "free hand." Of the other four cases, managers of three were also allowed to run the business with a relatively "free hand." One of the managers was in charge of the "mechanics" of running the elevator, but made no decision as to pricing or to whom to sell. Since management was so closely related to ownership, incentives for management, such as profit sharing, were not offered.

Nine of the firms were single unit operations; i.e., they operated elevators in only one place. Two of the firms operated two elevators each and the remaining firm was part of a national agricultural corporation with diversified interests. The owners seemed to integrate vertically rather than horizontally; i.e., they owned various local agriculturally related businesses instead of owning several elevators. It should be noted, however, that a looser form of horizontal integration existed in a few cases through financial arrangements and interlocking ownership interests.

## Labor

Operators of all 12 survey firms indicated that labor posed no particular immediate problems for them. Only one manager stated that obtaining, training, and keeping labor was a problem and another expressed difficulty in retaining competent office help.

Labor requirements, by season, for the 12 firms surveyed are shown in Table 1. Some firms used six or seven seasonal employees while others used none. Those firms not requiring seasonal labor were able to utilize labor, when not needed for the elevator operation, in other types of business which they conducted.

Two firms offered hospitalization insurance, the only formal fringe benefit discovered in the survey. Available labor, both in terms of

**TABLE 1.—Seasonal Labor Requirements Reported by 12 Local Grain Elevators, Louisiana, 1960**

|                    | Number of employees |                  |
|--------------------|---------------------|------------------|
|                    | Per firm            | Most usual range |
| March-May          | 2                   | 0-5              |
| June-August        | 2                   | 0-7              |
| September-November | 5                   | 3-7              |
| December-February  | 2                   | 0-4              |



number and quality, and even on a seasonal basis, was reported as adequate.

### Capital Requirements

If the 12 firms are typical of the industry, more than \$4 million had been invested in the 29 firms in Louisiana as of 1960. The average capital invested in fixed facilities was about \$146,000 for the 12 firms surveyed, ranging from \$20,000 to \$350,000. The capital required for peak inventory was an average of \$106,500 with a range of from \$35,000 to \$400,000.

The following question was asked: "Would you add additional equipment or make improvements in your facility if more favorable credit could be obtained?" Two managers answered yes to this question. Although few would change any part of their plant if they could obtain more favorable financing, they generally felt that available credit terms were too stringent. Much of the security required for such credit was other than the grain elevator.

Another question asked was: "If you had more alternatives to financing, would different sales channels be available to you?" All managers answered no. As soon as a railroad car is filled with grain, an operator can draw a draft on the terminal buyer for 90 percent of the value of the grain. This amount usually will cover the cost of purchasing grain. Thus, operating capital during the harvest season posed no particular problem.

Another capital problem besides operating capital during the harvest season was financing grain in storage. Most of the firms fill their storage capacity with soybeans at the end of the harvest season and sell in the spring, causing a seasonal burden on capital requirements.

### Facilities

Average bulk bin storage capacity in the 12 survey elevators was 57,000 bushels (Table 2). Storage capacity ranged from 202,730 bushels to 1,000 bushels, with two-thirds of the firms in the 18,000 to 60,000 bushel range. The firm with only 1,000 bushels of storage loaded di-

TABLE 2.—Storage Capacity and Grain Handled, 12 Local Grain Elevators, Louisiana, 1960

| Item                  | Per local grain elevator |                  |
|-----------------------|--------------------------|------------------|
|                       | Average                  | Most usual range |
|                       |                          | (1,000 bushels)  |
| Storage capacity      | 57                       | 18 to 60         |
| Grain handled         | 216                      | 100 to 350       |
| Turnover <sup>1</sup> | 3.4                      | 2.2 to 6.1       |

<sup>1</sup>Grain handled divided by storage capacity.

rectly from the dumping pit into railroad cars. Storage in this facility was rarely used.

All the storage capacity of the 12 firms was of the bulk bin type except about 6,000 bushels of flat bulk storage used by one firm. Feed and cottonseed storage facilities were also available to two operators for grain storage at certain times if needed.

The firms varied as to the volume of grain handled in relation to storage capacity. Most of the 12 firms handled grain amounting to between two and six times their storage capacity. However, one firm handled less grain than its storage capacity while another firm handled more than 200 times as much grain as its storage capacity.

Most of the firms began operating during the last 10 years but several had made considerable changes in their plants since beginning operations. Five of the firms had added more storage. One had added a dryer and cleaner. Another had added temperature sensing equipment. Most of the firms began with much less than their present grain handling capacity.

Two operators planned to enlarge the dumping capacity and speed for handling grain. One firm planned to begin barge shipments. Enlarged storage was the goal of five firms.

The firms' managers were asked what changes would be made if they were rebuilding. Some firms had just started operations and operators, therefore, had no comments. Many of the comments as to changes that might be made were caused by rapid increases in grain production and thus by the volume of grain available to elevators in the area. This is especially true of the amount of storage space and adequacy of facilities such as dryers, cleaners, and dump pits. Some of the comments as to changes that would be made if rebuilding should be particularly interesting to anyone considering entering this business. They were:

- Locate out of town.

- Locate on rail.

- Locate on rail and water.

- Locate away from rail (causes bottlenecks in truck traffic around elevator).

- Employ an engineer experienced with grain elevator operations to help design the facility and supervise construction.

- Locate on higher ground.

- Arrange facilities differently; e.g., provide for weighing and dumping at the same place, thus allowing for weighing before and after dumping without moving the truck.

- Use different building material; e.g., steel or mono-liquid concrete rather than wood.

Install larger dryer and cleaner.  
 Install belts instead of screw conveyors.  
 Build all gravity flow bins with hopper bottoms.  
 Build larger dumping pit.  
 Build larger scales.  
 Design for ease in expansion.  
 Build more storage.  
 Employ a contractor to construct the facilities.  
 Provide adequate building bond for contractors.

## Kind of Grain Handled

Seventy percent of the grain handled by local elevators in Louisiana was soybeans. Soybeans and corn together amounted to 84 percent (Table 3). The balance consisted of wheat and oats. Both corn and soybeans are harvested in the fall season and, although the corn harvest peak is reached somewhat sooner than the peak for soybeans, the harvest season of the two grains overlap. Wheat and oats are largely harvested in the summer.

The kind of grain handled by local grain elevators in various regions of the country is different. However, considering the large proportion of soybeans handled by Louisiana elevators, the problem of seasonality is probably somewhat more critical than in other areas of the nation. Estimated receipts of grain in 1960, by months, for 12 local elevators in Louisiana are shown in Table 4.

## Grain Procurement

Ten firms purchased all of their grain from farmers at the time of delivery. One firm contracted with farmers for 10 percent of its

**TABLE 3.—Percentage Distribution of Kinds of Grain Handled by Local Elevators, Louisiana 1960, Illinois 1957, and Kansas 1958**

| Kind of grain | Louisiana        | Illinois       | Kansas |
|---------------|------------------|----------------|--------|
|               | Percent of total |                |        |
| Soybeans      | 70               | 25             | 3      |
| Corn          | 14               | 55             | 9      |
| Oats          | 5                | 9              | 1      |
| Wheat         | 11               | 11             | 60     |
| Grain sorghum | — <sup>1</sup>   | — <sup>1</sup> | 27     |
| Total         | 100              | 100            | 100    |

<sup>1</sup>None reported.

Source: C. P. Schumaier, *Truck Shipment of Grain in Illinois, 1956*, AERR 25, Department of Agricultural Economics, University of Illinois, College of Agriculture, August 1958 and Orlo Sorenson, *Truck Transportation of Kansas Grain*, Agricultural Economics Report No. 97, Kansas Agricultural Experiment Station, June 1961. Louisiana data were estimated from the survey.

TABLE 4.—Estimated Receipts of Grain by 12 Local Elevators, Louisiana, 1960

| Month <sup>1</sup> | 1,000<br>bushels | Percent<br>of total |
|--------------------|------------------|---------------------|
| May                | 15               | .6                  |
| June               | 376              | 14.5                |
| July               | 13               | .5                  |
| August             | 54               | 2.1                 |
| September          | 188              | 7.2                 |
| October            | 879              | 33.9                |
| November           | 909              | 35.0                |
| December           | 162              | 6.2                 |
| Total              | 2,596            | 100.0               |

<sup>1</sup>Receipts in January through April were insignificant.

Source: Unpublished data of the Louisiana Agricultural Experiment Station.

grain at the beginning of the growing season and another contracted 33 per cent. All grain was purchased outright rather than handled for the account of the farmer.

Four firms hedged in the futures market against stored grain and two hedged against grain contracts with farmers. Some firms hedged only part of the operation.

The 12 grain elevators in the survey obtained grain from an average radius of 13.33 miles. The range was from less than 1 mile to 35 miles. The relatively short distance was probably the result of farmers selling to the nearest elevator. The pressure to finish a grain harvest during favorable weather resulted in a premium on the time of farmers and their equipment, thus tending to induce them to sell at the nearest elevator. However, there were probably enough farmers who shopped for price to maintain fairly competitive prices among elevators.

## Grain Sales

A large proportion of total sales were made either to terminal merchants or to processors (Table 5). Terminal merchant buyers primarily handle Louisiana grain through export elevators located on the Mississippi River at Port Allen and New Orleans, Louisiana. Processors were either feed or oil mill operators.

Some corn and oats are sold directly to farmers and some of each of the four grains listed are sold to other local elevators. Some local elevators were not well equipped to dry and blend grain and thus found it advantageous to sell to other local elevators which were well equipped to do this job before shipping to terminal markets or storing for sale later in the season.

Whether or not a broker was used varied widely between operators and between grains (Table 6). For example, some sold as high as 70



**TABLE 5.—Grain Sales by Specified Market, 12 Local Grain Elevators, Louisiana, 1960**

| Kind of grain and market | Percent of total |        |
|--------------------------|------------------|--------|
|                          | Average          | Range  |
| Soybeans                 |                  |        |
| Other local elevators    | 2                | 0-10   |
| Processors               | 21               | 0-60   |
| Terminal merchants       | 77               | 40-100 |
| Total                    | 100              | —      |
| Corn                     |                  |        |
| Farmers                  | 9                | 0-40   |
| Other local elevators    | 4                | 0-23   |
| Processors               | 72               | 0-100  |
| Terminal merchants       | 15               | 0-80   |
| Total                    | 100              | —      |
| Oats                     |                  |        |
| Farmers                  | 6                | 0-30   |
| Other local elevators    | 3                | 0-15   |
| Processors               | 55               | 0-100  |
| Terminal merchants       | 36               | 0-75   |
| Total                    | 100              | —      |
| Wheat                    |                  |        |
| Other local elevators    | 4                | 0-15   |
| Terminal merchants       | 96               | 85-100 |
| Total                    | 100              | —      |

**TABLE 6.—Grain Sales Through Brokers, 12 Local Grain Elevators, Louisiana, 1960**

| Kind of grain | Percent of total |        |
|---------------|------------------|--------|
|               | Average          | Range  |
| Soybeans      | 46               | 5-70   |
| Corn          | 23               | 0-70   |
| Oats          | 23               | 0-70   |
| Wheat         | 81               | 55-100 |

percent of their soybeans through brokers whereas others sold as little as 5 percent in this manner.

Local grain elevator operators apparently feel more need for brokers' services when selling to terminal merchants than when selling to farmers or the processing market. Nearly all the wheat is sold to terminal merchants as is a relatively large proportion of soybeans.

Two main bases of selling grain were reported by the 12 local grain elevator operators (Table 7). They are described here as "on track" and "to arrive." "On track" means that the buyer assumes the risk of a price change and pays the freight to the point of delivery. "To arrive" means that the buyer bears the risk of a price change but the seller pays the freight to the point of delivery. None of the 12 operators sold on consignment.

TABLE 7.—Basis of Grain Sales, 12 Local Grain Elevators, Louisiana, 1960

| Kind of grain | Percent of total |       |           |         |
|---------------|------------------|-------|-----------|---------|
|               | On track         |       | To arrive |         |
|               | Average          | Range | Average   | Range   |
| Soybeans      | 9                | 0-60  | 91        | 40-100  |
| Corn          | 20               | 0-50  | 80        | 50-100  |
| Oats          | 10               | 0-50  | 90        | 50-100  |
| Wheat         | 0                | 0-0   | 100       | 100-100 |

One operator remarked that local grain elevators are generally not in a position to extend more favorable terms of sale to any except those whose credit and business integrity is unquestionable. He observed that a loss of one or two truckloads of grain would eliminate any profits a small firm, such as his own, could expect during a season. Such a situation probably precludes some sales that could otherwise be favorably consummated with local feed mills and results in a certain amount of crosshauling of feed grains.

### Pricing

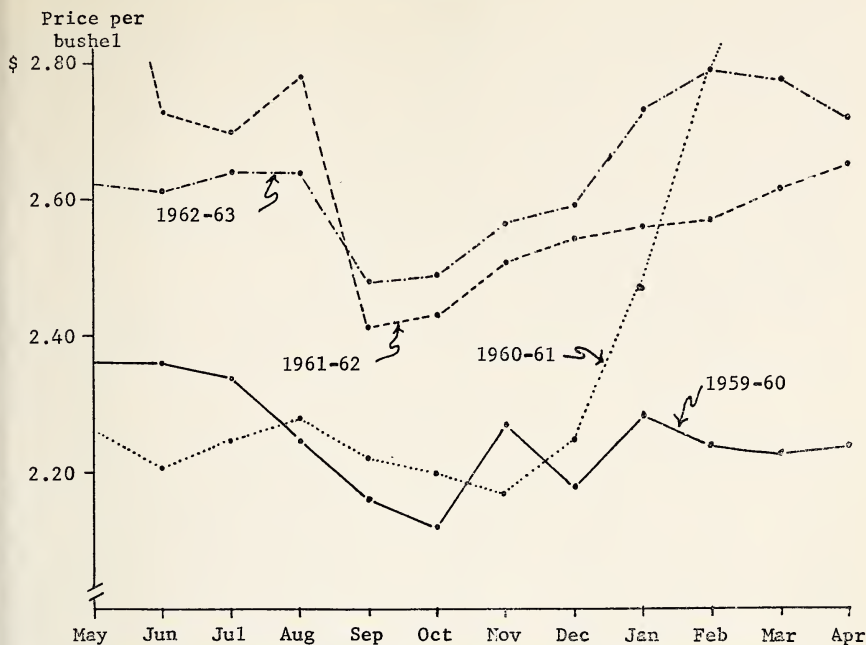
Gross margins reported by the 12 elevators, excluding a margin for transportation to a terminal market, ranged from 5 to 20 percent on purchases. The most typical gross margin sought in the industry, however, is 10 cents per bushel. Allied activities such as drying, blending, and storing grain help to achieve or even exceed the margin sought. Often the value of grain is enhanced by drying. And two or more lots of poor quality grain are sometimes blended into one lot of a better quality grain if the original lots were of poor quality for different reasons. Moreover, Martin and others report that 2 to 4 percent more corn can be saved from a crop by early harvesting if there are drying facilities to handle high moisture corn.<sup>4</sup>

Extra income from storage is often earned by elevator operators who, at the end of the season, hold grain in the facilities for sale later in the year. In fact, holding grain even for a short period of time often contributes to an increased margin if it does not interfere with the volume that would otherwise be handled. For example, prices of soybeans delivered to export elevators in Louisiana began seasonal increases by mid-September in two out of the past four years and by mid-October in three out of the four years (Figure 2). In one year, however, the seasonal price increase did not begin until mid-November.

On the other hand, with falling prices it is often to the elevator operator's advantage to sell grain as quickly as possible after purchasing

<sup>4</sup>Martin, James E., Lee R. Martin, and W. D. Toussaint, *Drying Wheat and Corn on North Carolina Farms*, Tech. Bul. No. 128, North Carolina Agricultural Experiment Station, Raleigh, North Carolina, March 1958.

**FIGURE 2.—Seasonal Prices for Soybeans Delivered to Export Elevators, Louisiana Gulf Area, May 1959 to April 1963.**



Source: Grain Market News, Louisiana Department of Agriculture, Baton Rouge, Louisiana.

or to hedge purchases in the futures market. One operator reported this to be especially true of early season corn purchases. The Louisiana corn crop matures slightly earlier than in the North Central region of the United States. Thus, some corn is being received in Louisiana elevators while terminal market prices are still seasonally falling.

Many of the managers were concerned with grading and pricing standards. They mentioned that grades at grain terminals were inconsistent or lower than had been measured before shipping the grain to them. However, the main concern was the confusion caused by so many standards. Among the standards used were (1) export, (2) processing, and (3) U.S.D.A. Each of these standards emphasizes different factors as bases for grading and pricing.

Under one system of pricing a farmer may be quoted a relatively high base price for grain but a severe set of price discounts will be applied to the grain for factors that do not measure up in quality. Under another system a relatively low base price will be offered with less severe discounts for quality factors.

Other confusing techniques in merchandising grain also exist in the

industry. A local association of elevators in Louisiana could eliminate much of this type of confusion, but there was no such organization in existence at the time of the survey.<sup>5</sup>

A question designed to describe the public relations program of the local grain elevators and to discover problems in this matter was asked in the survey. The only problem reported was a number of misunderstandings with growers arising primarily from various pricing and discounting procedures used by different elevator operators. Although none of the elevator operators maintained a conscious formal program in community relations, relations with the communities in which they were located were otherwise good.

The average number of competitors reported by the 12 firms was 5.6. The range was from none to 17. However, the firm which reported 17 competitors considered a large portion of the Mississippi Delta as a potential area of grain procurement, although he obtained no grain at distances over 35 miles. He stated that if his prices were out of line other firms would be potential buyers from his suppliers.

Each firm was asked whether the number of competitors was too large for each to operate efficiently. Three firms answered yes. Two stated that there were not too many but that any more would be too many. Seven firms stated flatly that there were not too many elevators in their area. Most managers were of the opinion that service (a form of non-price competition) was used more than price as a competitive tool.

## Sideline Activities

Eight of the 12 grain elevator firms also sold farm supplies. This was not a complete line of farm supplies, but usually consisted of items needed to grow grain, such as seed, fertilizer, insecticides, and other chemicals. Two firms also operated feed mills in conjunction with the elevator. Six firms operated cotton gins. A recent shift to soybeans on land formerly devoted to cotton probably encouraged gin owners to enter the elevator business. Seven owners of grain elevators were also farmers.

Only 2 of the 12 firms stored grain for farmers on a custom basis. Six firms dried grain and 7 firms cleaned grain for growers.

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<sup>5</sup>On February 14, 1963, a charter was issued to the newly formed Louisiana Grain and Feed Dealers Association, Inc. The association includes local grain elevator operators as well as feed millers, terminal merchants and others. The present mailing address of the association is c/o C. E. Pope, Secretary-Treasurer, Knapp Hall, L.S.U., Baton Rouge, Louisiana. Also, a number of local grain elevator operators in Louisiana are members of the Mid-South Grain Shippers' Association.



## Uncertainty and the Future

Uncertainty associated with federal farm programs in the future was a major concern of grain elevator operators in Louisiana. Changing the policy on grain, cotton, or any other farm commodity produced in the area causes a shift in land use. Grain elevators are rather specialized facilities that would have little alternative use in the event of a change that would decrease grain production in the area. Investments in such facilities must be recovered rather quickly in view of such uncertainty.

All of the operators interviewed expressed optimism as to the future of the local grain elevator business in Louisiana. However, two operators stated that there were enough elevators and that in a few years competition would be keener. One operator stated that the future depended upon the success of farmers in growing and marketing grains.

## Problem Areas

There are many factors to consider in building and operating local grain elevators. Before undertaking such an operation one should consult other grain elevator operators in the area, written material on the subject, and technical experts in the field. Newsletters, price bulletins, trade journals, and newspapers were all listed by the operators in the survey as publications useful in planning and guidance. Some firms also listed grain brokers as a good source of information.

Some "benchmark" data for appraising local grain elevator operations is shown in Appendix D. The operation presented is one which just breaks even on a cash basis (before depreciation but after interest and principal payments) while handling 216,000 bushels of grain annually in a concrete stave type elevator with 55,000 bushels of storage capacity. Income, costs, and investment data are for a typical type of operation and a relatively new elevator. Total cost after depreciation and an imputed return of 6 percent on one-half the original investment (in place of interest and principal payments) is also shown.

More than 216,000 bushels could probably be handled with very little increase in total cost and less than 216,000 bushels would decrease total cost very little. Thus, a decrease in volume would tend to intensify and an increase would tend to decrease problems. For example, less than 216,000 bushels of grain handled would likely increase the payout period to more than 8.1 years and a greater volume would reduce the payout period.

These synthesized data are based on intense observation of the operation of three firms and provide a reasonable framework or "benchmark" from which to analyze other situations. Individual operators, even with different types of operations will find these benchmarks useful in appraising their own operations.

### Volume of Grain Handled

Hall reported that merchandising costs for new country elevators in the Midwest ranged from 5.08 cents per bushel for an elevator with 20,000 bushels of storage capacity through which 250,000 bushels of grain are handled to 2.63 cents per bushel for an elevator with 250,000 bushels of storage capacity through which 1.5 million bushels are handled.<sup>6</sup>

Such studies tend to substantiate the contention of some local grain elevator operators in Louisiana that there are too many local elevators for the available volume of grain. They contend that margins could be reduced substantially or services improved if there were fewer elevators handling the available grain or if more grain were available for the same number of elevators.

Trends in grain production in Louisiana are shown in Table 8. Soybean production, nearly all of which is first handled by local grain elevators in Louisiana, has increased greatly over the 1945-54 average. This increase has come about in two ways. Acreage has increased fivefold and production per acre has nearly doubled. Government policy, not only with respect to soybean production but other agricultural commodities competing for the use of land, will largely determine the amount and quality of land that will be used for soybeans in the area in the future.

Individual elevator operators attempt to increase production per acre in the area from which they procure by encouraging better cultural practices and development of improved cultural practices, better varieties, and the like. A checklist of various devices that might be used to increase local grain production would be useful to grain elevator operators, farmers, and others interested in the economic development of the area.

## Kind of Grain Handled

With a given facility more grain can be handled and profits probably increased, or problems decreased, if receipts can be spread over a

<sup>6</sup>Hall, Thomas E., *New Country Elevators, Influence of Size and Volume on Operating Costs*, FSC Circular 10, U.S.D.A., Washington 25, D.C., June 1955.

**TABLE 8.—Trends in Grain Production, Louisiana, 1945-60**

| Grain         | Average<br>1945-54 | 1955   | 1956            | 1957   | 1958   | 1959   | 1960  |
|---------------|--------------------|--------|-----------------|--------|--------|--------|-------|
|               |                    |        | (1,000 bushels) |        |        |        |       |
| Soybeans      | 618                | 1,936  | 2,295           | 2,499  | 2,860  | 3,552  | 5,184 |
| Corn          | 14,963             | 17,640 | 15,390          | 12,052 | 14,672 | 16,269 | 9,126 |
| Oats          | 2,192              | 4,092  | 3,472           | 2,565  | 1,352  | 2,573  | 1,400 |
| Wheat         | —                  | 374    | 700             | 1,344  | 672    | 1,200  | 832   |
| Grain Sorghum | 46                 | 250    | 115             | 175    | 600    | 272    | 162   |

Source: *Agricultural Statistics 1945-62*, U.S.D.A., Washington, D.C., 1946-63.

longer period of time. The costs indicated in Appendix D for local grain elevator operations in Louisiana are much higher than that reported by Hall.<sup>7</sup> This is probably because of the relatively high concentration of soybeans handled by Louisiana elevators for which facilities must be provided but for which there is little use during the remainder of the year, compared with similar operations in the Midwest. Moreover, North Central region operations generally handle much more government owned and farm stored grain in off seasons than do those in Louisiana.<sup>8</sup> Practically no government and farm stored grain is handled by local elevators in Louisiana, compared with more than 15 percent in the North Central region.

This logic tends to support those who contend that there are not too many local grain elevators in the area. Inadequate facilities for handling the crop can be just as detrimental to the industry as too many facilities.

Table 8 indicates that corn, although somewhat erratic in production from year to year, sustained a relatively high rate of production until 1960. Actually much of the corn produced in Louisiana is fed on the same farms where grown or is sold directly to neighboring farms, itinerant truckers, feed mills, terminal grain merchants, or in some other way bypasses local grain elevators. The amount that does pass through local elevators, however, is important to them and could easily mean the difference between a profit and a loss. In recent years, with the advent of an increased number of local elevators and thus a more dependable market, a larger part of the corn crop has been handled by local grain elevators.

Local grain elevator operators in Louisiana individually attempt to spread their season of operation by encouraging the development and planting of varieties that mature at different times and by encouraging the planting of different kinds of grain in the area.

## Gross Margins

The operation shown in Appendix D assumes an average gross margin of 10 cents for each bushel handled. An extra amount would need to be charged for transportation to the terminal market. Since margins needed for transportation vary slightly with distance to the terminal market, it is not included in the margin shown. The average 10 cent margin, along with other income shown, would cover the costs of handling, buying, selling, drying, storage, blending, and otherwise merchandising the grain.

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<sup>7</sup>Ibid.

<sup>8</sup>Haldeman, Robert C., Robert M. Bennet, Joseph R. Corley, Ralph O. Foster, and John H. Hunter, Jr., *Grain Transportation in the North Central Region*, Marketing Research Report No. 490, USDA, Washington, D.C., July, 1961.

An increased gross margin would increase income, provided purchases did not decrease as a result. Or a decreased gross margin might increase volume provided competitors did not follow. A better understanding by the industry of costs and trading practices such as pricing, grading, weighing, and contracts would be of great value. An industry association could then, if interested, more easily minimize the problems caused by the confusion noted previously through standardizing trading practices. And, with such knowledge, individual operators could then more readily determine how their business was faring as an operating season progressed.

## **Sideline Activities**

Grain elevator operations typically use certain facilities and key personnel in common with other operations, such as a farm supply store or others mentioned previously. The operation in Appendix D assumes that other operations would contribute \$7,600 toward the manager's and assistant manager's salary and to such items as roads, railroad tracks, land and allied expenditures used in common with the elevator operation. Elevator operators not able to profitably utilize facilities and key personnel in other operations when not needed for the elevator operation are likely to have a critical problem with costs of operations and/or retaining needed personnel.

Miscellaneous income from weighing, handling government grain, and other sources sometimes present opportunities. Such items for elevator operations in Louisiana appear negligible compared with grain elevator operations in other regions of the nation.

## **Investment Costs and Capital Requirements**

Item IV of Appendix D summarizes estimated funds needed for building an elevator of the type used in this analysis. One of the foremost among the problems pointed up by this study is the terms of loans available to grain elevator operations for facility loans. Although an elevator structure physically will easily last more than 15 years, creditors almost inevitably require that facility loans be repaid in 5 years or less. Moreover, creditors ordinarily loan only 50 percent of the investment or less and usually require other assets for security. If longer term loans could be developed on a sound basis, interest and principal payments could be reduced and one of the most pressing problems of the industry would be solved.

The data on required investment in Appendix D is for concrete stave type storage. Wood or metal structures would cost less initially, but would probably be a little more expensive to maintain. Other types of storage might cost more. The efficiency of various types of construc-



tion and of varying other aspects of a grain elevator operation in Louisiana is not well known.

Other investment costs might vary from the investment shown in Appendix D. For example, it is quite possible that property taxes might be waived and other aids rendered under Louisiana's industry inducement program.<sup>9</sup> Site and other costs also might vary substantially in a given situation. In this study a wide range of investment costs was noted. While the data presented in Appendix D were carefully collected and should be useful as benchmarks, study is needed to determine why investment costs vary, so that such factors can be more readily considered if further expansion of the industry is undertaken or individual facilities are rebuilt.

## Operating Costs and Returns

A study of costs and returns by a standardized accounting procedure is needed. Most records kept by the firms were adequate for tax purposes or banking but not very adequate for economic analysis. Practically every elevator maintains a different set of accounts so that a comparative analysis would be very difficult indeed. Only in total, and after a year's operation, could an operator tell how his firm fared for the year.

When the records resulting from an adequate accounting procedure are compared with those of previous seasons of operations, industry averages, or other benchmarks, problem areas in costs and returns can be more readily delineated and measures taken to solve them. In fact one study contends that successful local elevator operations usually are associated with adequate accounting procedures.<sup>10</sup> A local elevator trade association could be instrumental in achieving the type of standardized accounting procedure needed for this purpose.

Some benchmark cost and return data are presented in Appendix D and some of it has been discussed in previous sections of this report. While this data will be useful to the typical operator in making a comparative analysis with the operation of his firm, and to a lesser extent for atypical operations, much more such data are needed if problems of the various sizes and types of operation are to be readily identified and needed changes made. Also more detailed cost data are needed to help effect more standardized trading practices as pointed out previously.

## Storage Activity

A better understanding of storage costs and effective seasonal grain prices to local elevators in Louisiana would also be of value to the

<sup>9</sup>*Louisiana Invests in Industry*, Department of Commerce and Industry, State of Louisiana, Baton Rouge, Louisiana, July, 1959.

<sup>10</sup>Ballow, E. B., *Accounting Procedure for Cooperative Grain Elevators*, Bulletin No. 26, Farm Credit Administration, U.S.D.A., Washington, D.C., November, 1938.

industry. During this survey, conducted in the summer of 1961, practically all the elevator operators expressed an interest in expanding storage capacity. During the 1960-61 season the price of soybeans rose from a seasonal low of \$2.17 per bushel in November to \$3.30 in April, an increase of \$1.13 per bushel. Undoubtedly, soybean storage was very profitable in 1960-61 for those who had not hedged and for those who did not hedge the full amount of grain stored.

Whether storage without hedging by local grain elevators is a sound practice is a problem for local elevator managers in Louisiana. Actually, one operator complained that he was not able to use the futures market effectively at certain times of the year because of the distance and direction of Louisiana from the Chicago market.

If the futures market cannot be depended upon to indicate the profitability of storage in Louisiana, experience over a longer period of time will determine whether expanded storage is sound practice. In particular years, such as 1960-61 when there was a large rise in prices, those with a large amount of storage capacity in relation to the volume of grain handled will operate profitably. In years such as 1959-60 they will probably operate at a loss while those with a small amount of storage capacity in relation to the volume of grain handled will operate profitably.

### **Other Problem Areas; Some Suggested Solutions**

During the survey a number of other problems were enumerated by elevator operators. These are presented below.

1. An adequate number of railroad cars was not always available.
2. Many of the railroad cars assigned to elevators contained holes that would allow grain to be lost if not repaired before loading.
3. Railroad cars frequently were held for 90 days at the terminal market before unloading, increasing the chances for quality deterioration of the grain for which the local elevator operator was responsible until unloaded. Moreover, the local grain elevator operator has 10 per cent of the value invested in the grain until it is finally unloaded at the terminal market.
4. Available trucks for shipping grain to terminal markets were reported as inadequate during certain seasons of the year.
5. Another problem concerns successful financial management. When needed working capital is invested in an elevator or any other fixed asset, serious problems often result. Although few problems were reported in the survey with regard to working capital for the local grain elevator, working capital for other enterprises conducted by some operators was reported as a problem resulting from investing too much in the grain elevator. In the other types of business, discounts are fre-

quently allowed in the trade for prompt payment of bills. Such discounts are frequently forfeited when working capital is scarce.

6. Some operators expressed a fear that national grain merchandising operations would soon enter the competitive structure of the area. These large businesses with better access to capital and experience were particularly feared by those who would be vulnerable to competition from a local elevator located on a river. In 1961, local elevators located on some rivers in Louisiana would have had a transportation advantage over nearby country elevators not located on these rivers.

7. A big problem with Louisiana soybeans is stinkbug damage. Because of the prevalence of this problem in the area, terminal merchants purchased soybeans from Louisiana elevators only on a U.S. No. 1 basis, whereas the common grade used for purchasing beans from further north is U.S. No. 2. The base price and schedule of discounts for No. 1 soybeans is such that soybean prices are severely discounted when stinkbug damage is found. A problem then is to find ways to minimize stinkbug damage.

To justify the basis of trading of U.S. No. 1 soybeans in Louisiana, terminal merchants report that many foreign markets purchase soybeans for table consumption rather than crushing for oil. They report that stinkbug damage lowers the quality of soybeans, especially for table consumption, resulting in severe price discounts to them for damaged soybeans.

It has been suggested that such damage does not warrant the severe discounts applied for this factor but that this and other trading practices used by some terminal merchants are used as an excuse to shade prices in the southern areas where competition for the available grain is not so intense. If this is the case only a more competitive market seems to hold much promise for relief. Such a market now appears to be emerging. The rapid growth of local grain elevators in Louisiana has been exceeded by that of markets at grain export facilities on the Gulf coast.

8. Because of moisture, insects, and perhaps other reasons, corn does not store well for long periods of time in Louisiana unless the moisture content is 13 percent or less. U.S. No. 2 corn may contain 15.5 percent moisture and this is the basis on which it is normally traded. Although a bushel of 13 percent corn may contain a greater amount of nutrients, no premium is given in the trade for it over corn with up to 15.5 percent moisture. A problem then would be to determine if such corn is superior to high moisture corn and if so, to develop a premium market for the 13 percent corn.

9. A material change in government policy with respect to feed grain in 1961 tended to decrease the amount of corn that would have

been produced in the area.<sup>11</sup> Under the new program, including slight subsequent changes, farmers are given great incentives for retiring up to 40 percent of their corn acreage and in some cases 100 percent. This is only one example of how government policy with respect to land use can affect local grain elevator operations. A problem for local grain elevator operators is to press for equitable solutions to such policy problems.

10. The difficulty experienced by some elevator operators in selling feed grain to local feed processors suggests consideration of a terminal or subterminal market in the producing area. Among the factors to be considered are (1) the extent to which a terminal market would be in a better position to deal with those whose business integrity and capabilities are not yet proven, (2) the volume of grain to be handled through such a market, (3) the role of such a market in importing feed grains into the area during certain periods of the year, and (4) the possibility of locating the market on one of the rivers in the area in order to realize cheaper transportation on feed grain imported into the area. A study of the economic feasibility of such a market would develop facts needed to come to a successful conclusion to this question.

11. Relations of elevators to the communities in which they were located, with few exceptions, were quite good. Some problems with growers resulted from the pricing confusion mentioned previously. Since, however, the industry is one of many small independent firms, their role in the economic structure of the state is probably not well known. Some way needs to be devised for these small firms to gain more favorable community attitudes such as large firms often enjoy.

## Summary and Conclusions

Basically, local grain elevators consolidate small lots of grain purchased from farmers into large truckload or carload lots and sell it to terminal merchants, processors, and others. This report describes various aspects of this operation in Louisiana with special attention to delineating problems in the industry. Further research would aid in developing the type of data needed to solve some of these problems.

Data for this study were obtained from a survey of 15 of the 29 local grain elevators in Louisiana in 1960, including an intense study of 3 such firms, and from consultation with officers of the Mid-South Grain Shippers Association. The 29 elevators, 24 of which began operations since 1954, have been very successful. There are, however, many problems faced by the industry.

Although the most common form of business organization found in

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<sup>11</sup>*The Demand and Price Situation*, DPS 75, U.S.D.A., March, 1961.



the industry in Louisiana was the corporation, management usually was closely associated with the ownership of the firms. And, with few exceptions, the firms were single unit operations. Owning rather than leasing land and facilities was the most usual situation.

Adequate labor was reported even though labor requirements of a local elevator are quite seasonal. Practically every operator conducted other business into which he could weave at least some of the key labor when not needed at the elevator. Where such a situation does not exist, there doubtlessly are problems that have to be overcome in some other way by local grain elevator operators.

Capital invested in fixed facilities averaged \$146,000 for the 12 survey elevators, ranging from \$20,000 to \$350,000. Total investment in fixed facilities in the industry amounts to more than \$4 million. With regard to capital for fixed facilities, a sound basis for longer term loans needs to be found. Most loans for fixed facilities were for 5 years or less, whereas most of the facilities would last 15 years or longer. Moreover, the facility usually was not considered as the main security for the loan by available credit sources. Rather, they looked to other assets of the operator first. Underlying this attitude toward loans was the relative infancy of this type of business in Louisiana. Local creditors have little experience with this type of operation. And the uncertainty of various government farm policy programs affecting future land use in the area also tends to create such an attitude.

Operating capital, except for financing grain in storage, posed no particular problems. As soon as grain is sold and loaded into a railroad car, a local operator can usually draw a draft on the terminal buyer for 90 percent of the sale price, normally enough to pay the cost of purchasing the grain.

During a season, an elevator ordinarily handles several times as much grain as there is storage capacity in the facility. At the end of the season, however, operators usually attempt to store grain in the facility which, up to then, was needed for working space, creating a relatively large demand for funds to finance grain in storage.

Investment of working capital needed for other enterprises conducted by the grain elevator operator in fixed assets such as a grain elevator can also result in problems for the operator in the other enterprises.

Although many of the firms had been operating only a short time, extensive changes had been made in the facilities, including increased storage and other changes designed to increase the capacity and efficiency of the plants. Others were planning such changes at the time of the survey. And still other changes would have been made in the physical facilities if the facilities were being rebuilt at the present time.

Eighty-four percent of the grain handled by the 12 survey elevators

was soybeans and corn, both largely harvested by growers and received by local grain elevators in the fall months in Louisiana. Grain elevator operators attempt to spread the season of operation by encouraging production of varieties maturing at different times and planting of different kinds of grain such as wheat and oats, which mature in the summer. When the season can be spread over a longer period, more grain can be handled with a given facility.

Usually the higher the volume of grain handled, the greater is the success of the elevator. Soybean production, the most important grain handled by local elevators in Louisiana, has nearly tripled since 1954 and is more than eight times greater than the 1945-54 average. Soybean production in the state now amounts to about five million bushels annually. There are a number of ways in which individual operators attempt to increase the volume of grain to be handled by their elevators.

Terminal grain merchants, operating out of elevators in Gulf ports, were the most important buyers of grain from local elevators in Louisiana. Other buyers included oil mills, feed mills, farmers, and other local grain elevators. Local elevators sometimes purchase grain from other local elevators because they are in a better position to dry, blend, store, or otherwise merchandise the grain.

A larger proportion of wheat and soybeans was sold through brokers than of corn and oats. And most of the grain was sold on a "to arrive" basis (buyer bears the risk of a price change during transit but the seller pays the freight to the point of delivery).

A great deal of confusion apparently reigns in the industry concerning pricing, although it is not usually mentioned as such. A local association of elevator operators could do much to eliminate this type of confusion but there was no such association in existence at the time of the survey. A better understanding of costs, pricing, grading, contracts, and other trading practices would be of considerable value to the industry.

The study also includes a framework for evaluating local grain elevator operations in Louisiana. This framework based on intense observation of three local elevator firms, presents synthesized "benchmark" data on costs and returns for the more typical type of operation handling an average volume of grain and breaking even. Problems and opportunities are discussed from this framework. However, much more such data are needed if the problems of the various sizes and types of operation are to be more readily identified and needed changes suggested.

Some firms are in need of more adequate accounting procedures for comparing costs and returns with previous seasons of operation, industry averages, and other benchmarks. Only then could comparative analy-

ses be made that would readily point to aspects of an operation that could be improved.

A better understanding of storage costs and probable returns from storage is also needed. Allied with this problem was a need for more knowledge on the conditions under which local grain elevator firms in Louisiana can use the futures market effectively.

Some way needs to be devised for the industry to gain more favorable community attitudes on a statewide basis such as large firms often enjoy. Since the industry is one of many small firms with practically no formal program in public relations, their vital role in the economic structure of the state is not well understood.

Also raised was the question of whether a terminal or subterminal market for feed grains consumed locally is needed or feasible. Many facts are needed to successfully answer this question.

Among other problems uncovered in the survey was the need for more adequate transportation for grain. Railroad cars, both in terms of numbers and quality, were cited, as was the need for more adequate truck transportation during certain seasons of the year.

## Appendix

### A. Directory of Local Grain Elevators in Louisiana, 1960

1. Briggs Elevator, Oak Grove
2. Brown Bros. Grain Elevator, Jonesville
3. Central Mill and Elevator Company, Mer Rouge
4. Concordia Grain Elevator, Ferriday
5. Crowville Elevator, Crowville
6. East Carroll Grain Cooperative, Lake Providence
7. Evangeline Cotton Oil Company, Ville Platte
8. Farmer's Elevator Company, Epps
9. Goldman Equipment Company, Waterproof
10. Jonesville Grain Elevator, Jonesville
11. Madison Grain Company, Tallulah
12. McClendon Elevator, Bastrop
13. Mer Rouge Elevator, Mer Rouge
14. Monticello Elevator, Epps
15. Newellton Elevator, Newellton
16. Oak Ridge Grain Elevator, Oak Ridge
17. Peoples Moss Gin Company, Palmetto
18. Red Barn Fertilizer Company, Gilliam
19. Red Barn Fertilizer Company, Monroe
20. Sims Seed Company, Rayville
21. Southland Cotton Oil Company, Tallulah
22. St. Joseph Grain Elevator, St. Joseph
23. Tallulah Elevator and Feed Company, Tallulah
24. Terrell-Norris Seed Company, Lake Providence
25. United Elevator Company, Ferriday
26. Union Oil Mill, Bunkie
27. Warren and Cooty Grain Company, Lake Providence
28. Waverly Grain Cooperative, Waverly
29. Winnsboro Elevator Company, Winnsboro

## B. Mail Questionnaire

CONFIDENTIAL

### DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS LOUISIANA AGRICULTURAL EXPERIMENT STATION LOUISIANA STATE UNIVERSITY

1. Name of Firm \_\_\_\_\_  

(Address) \_\_\_\_\_
(Town or City) \_\_\_\_\_
(Parish) \_\_\_\_\_
2. What is the nature of your business?<sup>1</sup> (For example, feed, seed and fertilizer retail store, feed mixing, sawmill, grain elevator, canning plant, etc.) \_\_\_\_\_
3. How long has this firm or its predecessor been in business? \_\_\_\_\_
4. Present type of ownership (Check one):  

Private \_\_\_\_\_
Cooperative \_\_\_\_\_

Partnership \_\_\_\_\_
Corporation \_\_\_\_\_

Other (Specify) \_\_\_\_\_
5. Type of physical organization (Check one):  

Single plant \_\_\_\_\_
One of two or more in the state \_\_\_\_\_

Part of national chain \_\_\_\_\_
Other (Specify) \_\_\_\_\_
6. (a) Size of service area for this plant (Fill in blanks below):  

North \_\_\_\_\_ miles
South \_\_\_\_\_ miles

East \_\_\_\_\_ miles
West \_\_\_\_\_ miles

(b) Number of parishes served \_\_\_\_\_
7. What is the estimated replacement value of your facility? \_\_\_\_\_
8. Number of employees (Fill in appropriate blanks): \_\_\_\_\_

| Type                  | Permanent |        | Additional<br>for Seasonal Work |        |
|-----------------------|-----------|--------|---------------------------------|--------|
|                       | Male      | Female | Male                            | Female |
| Manager               |           |        |                                 |        |
| Office Workers        |           |        |                                 |        |
| Field Representatives |           |        |                                 |        |
| Servicemen            |           |        |                                 |        |
| Laborers              |           |        |                                 |        |
| Unskilled Operators   |           |        |                                 |        |
| Others                |           |        |                                 |        |

9. Volume of gross business during a typical year (Check opposite appropriate figure):

|                 |       |                     |       |  |
|-----------------|-------|---------------------|-------|--|
| Under \$25,000  | _____ | 350,000- 399,999    | _____ |  |
| 25,000- 49,999  | _____ | 400,000- 449,999    | _____ |  |
| 50,000- 74,999  | _____ | 450,000- 499,999    | _____ |  |
| 75,000- 99,999  | _____ | 500,000- 599,999    | _____ |  |
| 100,000-124,999 | _____ | 600,000- 699,999    | _____ |  |
| 125,000-149,999 | _____ | 700,000- 799,999    | _____ |  |
| 150,000-174,999 | _____ | 800,000- 899,999    | _____ |  |
| 175,000-199,999 | _____ | 900,000- 999,999    | _____ |  |
| 200,000-249,999 | _____ | 1,000,000-1,499,999 | _____ |  |
| 250,000-299,999 | _____ | 1,500,000-1,999,999 | _____ |  |
| 300,000-349,999 | _____ | 2,000,000-over      | _____ |  |

<sup>1</sup>Note that the name of a firm does not always reflect the true nature of the business.

CONFIDENTIAL



## C. Interview Schedule

### CONFIDENTIAL

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS  
LOUISIANA STATE UNIVERSITY

#### A STUDY OF PROBLEMS OF SMALL AGRICULTURAL BUSINESS GRAIN ELEVATORS

Date \_\_\_\_\_ Enumerator \_\_\_\_\_  
Parish \_\_\_\_\_ Schedule No. \_\_\_\_\_  
Name and Address of Firm \_\_\_\_\_

\_\_\_\_\_ Telephone \_\_\_\_\_  
Name of Person Interviewed \_\_\_\_\_ Position \_\_\_\_\_

##### I. Origin and Ownership

1. Year this firm or its predecessor started in business at this location? \_\_\_\_\_

2. Type of office at this location, i.e., single unit, branch, etc. \_\_\_\_\_  
\_\_\_\_\_ (If this is a branch or line elevator, questions marked  
with \* may be omitted.)

\*3. What was the original type of ownership, and what is it now?

|                             | Proprietor | Partnership | Corporation | Other |
|-----------------------------|------------|-------------|-------------|-------|
| Original                    | _____      | _____       | _____       | _____ |
| Now                         | _____      | _____       | _____       | _____ |
| Reason for change<br>if any | _____      | _____       | _____       | _____ |

\*4. Do you plan to change the type of organization? If so, why? \_\_\_\_\_  
\_\_\_\_\_

5. Does your firm own or lease?

|           | Own   | Lease | If lease, why? |
|-----------|-------|-------|----------------|
| Land      | _____ | _____ | _____          |
| Buildings | _____ | _____ | _____          |

##### II. Physical Characteristics of Firms

1. Briefly describe the changes you would make in facilities if you were building it again regarding:

| Item                                    | Reason(s) |
|-----------------------------------------|-----------|
| a. Location                             | _____     |
| b. Transportation arrangements          | _____     |
| c. Size of operation                    | _____     |
| d. Building material                    | _____     |
| e. Engineering                          | _____     |
| f. Legal service during<br>construction | _____     |
| g. Contractor                           | _____     |
| h. Plant design                         | _____     |
| i. Equipment                            | _____     |
| j. Financing                            | _____     |
| k. Other (specify)                      | _____     |

2. What major changes have you made in your facilities in the past ten years? \_\_\_\_\_

3. What major changes do you plan to make in the next five years? \_\_\_\_\_

4. What is your total storage capacity in bushels? Total \_\_\_\_\_  
Bulk bins \_\_\_\_\_ Bulk flat \_\_\_\_\_ Sack \_\_\_\_\_

5. Sideline activities of this plant—public scale, grind corn, crimp oats, pelletize feed, mix feed, sell farm supplies, other sideline activity? \_\_\_\_\_
6. In this plant do you (circle appropriate activities) shell corn, dry grain, store grain, clean grain, other elevator activity? (explain) \_\_\_\_\_
7. Square feet used primarily for office? \_\_\_\_\_ Service area for sideline activities of elevator? \_\_\_\_\_  
Service area to grain elevator excluding space primarily occupied by grains? \_\_\_\_\_

### III. Business and Growth

1. Approximate size of your drawing area? Miles \_\_\_\_\_  
North \_\_\_\_\_ East \_\_\_\_\_ South \_\_\_\_\_ West \_\_\_\_\_
2. How many competitors do you feel you have? \_\_\_\_\_  
Located in the above area? \_\_\_\_\_
3. Is this too many for each to operate efficiently? \_\_\_\_\_  
Explain \_\_\_\_\_
4. How many bushels of grain was handled through your elevator during the 1960-61 season?

| Grain    | For Account of Elevator | Custom Basis |
|----------|-------------------------|--------------|
| Soybeans | _____                   | _____        |
| Corn     | _____                   | _____        |
| Oats     | _____                   | _____        |
| Wheat    | _____                   | _____        |
| Sorghum  | _____                   | _____        |
| Other    | _____                   | _____        |

5. Sales of firm during 1960-61 season

|                       | Dollars | Change in Physical Volume<br>Over 5 Years Ago |
|-----------------------|---------|-----------------------------------------------|
| Grain                 | _____   | _____                                         |
| Custom grain handling | _____   | _____                                         |
| Sideline activities   | _____   | _____                                         |

### IV. Seasonality of Business

1. What is the maximum seasonal labor and operating capital needed during the following seasons?

|                           | Number of<br>seasonal employees | Amount of<br>operating capital |
|---------------------------|---------------------------------|--------------------------------|
| March 1 - May 31          | _____                           | _____                          |
| June 1 - August 31        | _____                           | _____                          |
| September 1 - November 30 | _____                           | _____                          |
| December 1 - February 28  | _____                           | _____                          |

2. What practices have you introduced to smooth out seasonal fluctuations? \_\_\_\_\_

### V. Employment

1. Labor turnover

|                | Number regularly employed by the firm |        | Number with you this year that were last year |        | Number quit or fired last year |        |
|----------------|---------------------------------------|--------|-----------------------------------------------|--------|--------------------------------|--------|
|                | Male                                  | Female | Male                                          | Female | Male                           | Female |
| Monthly salary | _____                                 | _____  | _____                                         | _____  | _____                          | _____  |
| Hourly wage    | _____                                 | _____  | _____                                         | _____  | _____                          | _____  |
| Seasonal       | _____                                 | _____  | _____                                         | _____  | _____                          | _____  |

2. Does your firm provide employees with fringe benefits such as insurance, hospitalization, retirement plans, bonuses, profit sharing, paid vacation, automatic salary raises or other? (Do not include F.I.C.A. and unem-

ployment insurance taxes, or workers compensation insurance.) \_\_\_\_\_

3. Do you have any problems in obtaining, training or keeping labor? \_\_\_\_\_

#### VI. Management

1. What other types of business is the ownership or management of this firm affiliated with through ownership, management, financing or other arrangements? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. If management is separate from ownership, what type of decisions does ownership have to approve? \_\_\_\_\_  
\_\_\_\_\_

And what incentives are offered to stimulate management performances? \_\_\_\_\_

3. What specific publications do you use for planning and guidance? \_\_\_\_\_

4. What are the most important things you do in obtaining the understanding and good will of the ownership of the firm, customers, suppliers, labor, the public and government employees? \_\_\_\_\_  
\_\_\_\_\_

#### VII. Sales and Purchases

1. In general, what gross margin on grain do you average during the course of a year? \_\_\_\_\_

2. With your present volume, what markup on grain must you average to break even? \_\_\_\_\_

3. How many bushels of grain in a season must you handle to break even with your present markup? \_\_\_\_\_

4. Could you operate on a smaller margin if you handled more grain in your present facilities (i.e., without adding more storage capacity)? \_\_\_\_\_

5. How does competition affect prices you pay for grain? \_\_\_\_\_

6. Do farmers consider prices paid for grain more important than service? Explain \_\_\_\_\_

7. In selling, do the terms used in the sales contract vary from time to time? \_\_\_\_\_  
How? \_\_\_\_\_

8. Percent or bushels sold<sup>1</sup>

|                 | Soybeans | Corn  | Oats  | Wheat | Grain<br>Sorghum |
|-----------------|----------|-------|-------|-------|------------------|
| Through brokers | _____    | _____ | _____ | _____ | _____            |
| On consignment  | _____    | _____ | _____ | _____ | _____            |
| "On track"      | _____    | _____ | _____ | _____ | _____            |
| "To arrive"     | _____    | _____ | _____ | _____ | _____            |

|                            | Soybeans | Corn  | Oats  | Wheat | Grain<br>Sorghum |
|----------------------------|----------|-------|-------|-------|------------------|
| 9. Percent or bushels sold |          |       |       |       |                  |
| To farmers                 | _____    | _____ | _____ | _____ | _____            |
| Other country elevators    | _____    | _____ | _____ | _____ | _____            |
| Processor/mfg.             | _____    | _____ | _____ | _____ | _____            |
| Other (specify)            | _____    | _____ | _____ | _____ | _____            |

<sup>1</sup>"On consignment" means the seller bears the risk of price changes and also pays the freight to the point of delivery. "On track" means the buyer assumes the risk of price change and pays the freight to point of delivery. "To arrive" means the buyer bears the risk of price change but the seller pays the freight to the point of delivery.

10. Bushels purchased from \_\_\_\_\_ Soybeans \_\_\_\_\_ Corn \_\_\_\_\_ Oats \_\_\_\_\_ Wheat \_\_\_\_\_ Grain Sorghum \_\_\_\_\_  
 Farmers \_\_\_\_\_  
 Other country elevators \_\_\_\_\_  
 Other (specify) \_\_\_\_\_
11. Of grain purchases from farmers, how much was purchased outright at time of delivery? \_\_\_\_\_% or bu. Purchased on contract? \_\_\_\_\_% or bu. Received for storage? \_\_\_\_\_%
12. How many bushels did you store: \_\_\_\_\_  
 Soybeans \_\_\_\_\_ Corn \_\_\_\_\_ Oats \_\_\_\_\_ Wheat \_\_\_\_\_ Grain Sorghum \_\_\_\_\_  
 For farmers \_\_\_\_\_  
 Account of elevator \_\_\_\_\_  
 Other (specify) \_\_\_\_\_
13. Do you use the futures market? \_\_\_\_\_ If so, is it to protect your position with regard to consignment selling? \_\_\_\_\_ Contract buying? \_\_\_\_\_  
 Storage for the account of the elevator? \_\_\_\_\_ To protect sale of depositor's grain for storage which the elevator did not own but could not store because of inadequate storage space? \_\_\_\_\_  
 Other? \_\_\_\_\_
14. What problems do you have with using the futures market? \_\_\_\_\_

# VIII. Capital Requirements and Credit

1. Value of investment \_\_\_\_\_ Initial \_\_\_\_\_ Present Book \_\_\_\_\_  
 Land \_\_\_\_\_  
 Facility \_\_\_\_\_  
 Furniture, fixtures, vehicular equip. \_\_\_\_\_  
 Total \_\_\_\_\_
2. Value of inventory at peak \_\_\_\_\_ low \_\_\_\_\_ average \_\_\_\_\_
- \*3. Source of Capital \_\_\_\_\_  
 Length Frequency Effective Security  
 Amount of Loan of Payment Interest Rate Required
- a. Initial investment \_\_\_\_\_  
 Owners' equity \_\_\_\_\_  
 Commercial bank \_\_\_\_\_  
 Regional or national merchant \_\_\_\_\_  
 Other (specify) \_\_\_\_\_
- b. Major improvement or expansion (if more than one, use back)  
 Retained earnings \_\_\_\_\_  
 Additional owner equity \_\_\_\_\_  
 Commercial bank \_\_\_\_\_  
 Other (specify) \_\_\_\_\_
- c. Operating capital \_\_\_\_\_  
 Commercial bank \_\_\_\_\_  
 Regional or national merchants \_\_\_\_\_  
 Other (specify) \_\_\_\_\_
- d. What is the present ratio of net worth to fixed assets? \_\_\_\_\_
- e. What is your fiscal year? \_\_\_\_\_
- f. On the date your last books were closed for the year, what was:  
 (1) Your ratio of receivables to current assets \_\_\_\_\_  
 (2) Current assets to current liabilities \_\_\_\_\_



- \*4. If you had more alternatives to financing, would different sales channels be available to you? \_\_\_\_\_ Explain \_\_\_\_\_
- \*5. Would you add additional equipment or make extensive improvement or additions to your plant if more favorable credit arrangements could be obtained? \_\_\_\_\_  
Explain \_\_\_\_\_

#### IX. Miscellaneous

1. What do you feel are some of the effects of the federal farm programs on your business? \_\_\_\_\_
2. Have technological changes affected your business appreciably? \_\_\_\_\_  
Explain \_\_\_\_\_
3. Do you expect any major changes in your operation (services rendered, type of customer, source of supply) in the next few years? \_\_\_\_\_ If yes, comment \_\_\_\_\_
4. Do you have any problems with grain grading standards? \_\_\_\_\_  
If yes, comment \_\_\_\_\_
5. Are transit privileges important to your business? \_\_\_\_\_  
If yes, explain \_\_\_\_\_
6. Have recent changes in railroad rates affected your business? \_\_\_\_\_  
If so, how? \_\_\_\_\_
7. Have you experienced difficulty in obtaining adequate railroad cars? \_\_\_\_\_  
Explain \_\_\_\_\_
8. Have you experienced difficulty in getting your grain unloaded and the sales transaction completed at terminal markets within reasonable lengths of time? \_\_\_\_\_ If yes, explain \_\_\_\_\_
9. Do you determine cost per bushel?  

|                    |               |
|--------------------|---------------|
| Merchandised _____ | Handled _____ |
| Dried _____        | Cleaned _____ |
| Stored _____       | Other _____   |
10. What do you think of the future of the country grain elevator business in Louisiana? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
11. List major problems you feel are facing country elevator operators in Louisiana \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## D. A Framework for Appraising Local Grain Elevator Operations in Louisiana

### I. Summary

|                                                                                           |          |
|-------------------------------------------------------------------------------------------|----------|
| A. Estimated average annual <i>cash</i> income, expense and surplus                       | \$29,700 |
| 1. Estimated income                                                                       | 19,300   |
| 2. Estimated operating expenses                                                           | 10,400   |
| 3. Estimated income available for debt repayment                                          | 9,900    |
| 4. Estimated interest and principal payments                                              |          |
| 5. Net surplus available over interest and principal payments                             | \$ 500   |
| 6. Payout: $\frac{\$83,300}{\$10,400} = 8.1$ years before depreciation                    |          |
| B. Estimated annual <i>total</i> average income, expenses and surplus                     | \$29,700 |
| 1. Estimated annual gross income                                                          | 27,400   |
| 2. Less operating expenses, depreciation and a return on the investment                   | \$ 2,300 |
| 3. Net surplus                                                                            |          |
| C. Estimated total funds required to finance costs of land, construction, equipment, etc. |          |
| 1. Cost of land                                                                           | \$ 2,200 |
| 2. Total buildings and equipment costs                                                    | 78,400   |
| 3. Escrowed interest during construction, etc.                                            | 2,700    |
| 4. Total funds required                                                                   | \$83,300 |

### II. Details: Estimated average annual *cash* income, expenses, and surplus

|                                                               |                       |
|---------------------------------------------------------------|-----------------------|
| A. Estimated income                                           | \$21,600 <sup>1</sup> |
| 1. 216,000 bushels @ \$.10 gross margin                       | 7,600                 |
| 2. Contribution to overhead from other operations             | \$ 500                |
| 3. Miscellaneous income                                       | \$29,700              |
| 4. Total                                                      |                       |
| B. Less operating expenses                                    | \$ 6,000              |
| 1. Manager                                                    | 3,000                 |
| 2. Assistant manager and bookkeeper                           | 2,800                 |
| 3. Seasonal labor, 3 men @ \$275 per month                    | 1,200                 |
| 4. Fringe benefits @ 10%                                      | 700                   |
| 5. Elevator supplies and repairs                              | 1,000                 |
| 6. Electricity                                                | 200                   |
| 7. Telephone and telegraph                                    | 500                   |
| 8. Insurance, facilities                                      | 200                   |
| 9. Insurance, grain                                           | 100                   |
| 10. Office supplies                                           | 1,200                 |
| 11. Legal and auditing                                        | 600                   |
| 12. Property taxes                                            | 1,800                 |
| 13. Reserve for contingencies                                 | \$19,300              |
| 14. Total estimated operating expenses                        | \$10,400              |
| C. Estimated income available for debt repayment              | \$9,900               |
| D. Interest and principal payments                            | \$ 500                |
| E. Net surplus available over interest and principal payments |                       |

### III. Estimated *total* average annual income, expenses and surplus

|                                  |          |
|----------------------------------|----------|
| A. Estimated annual gross income | \$29,700 |
|----------------------------------|----------|

<sup>1</sup>Not including a margin for transportation to terminal markets.

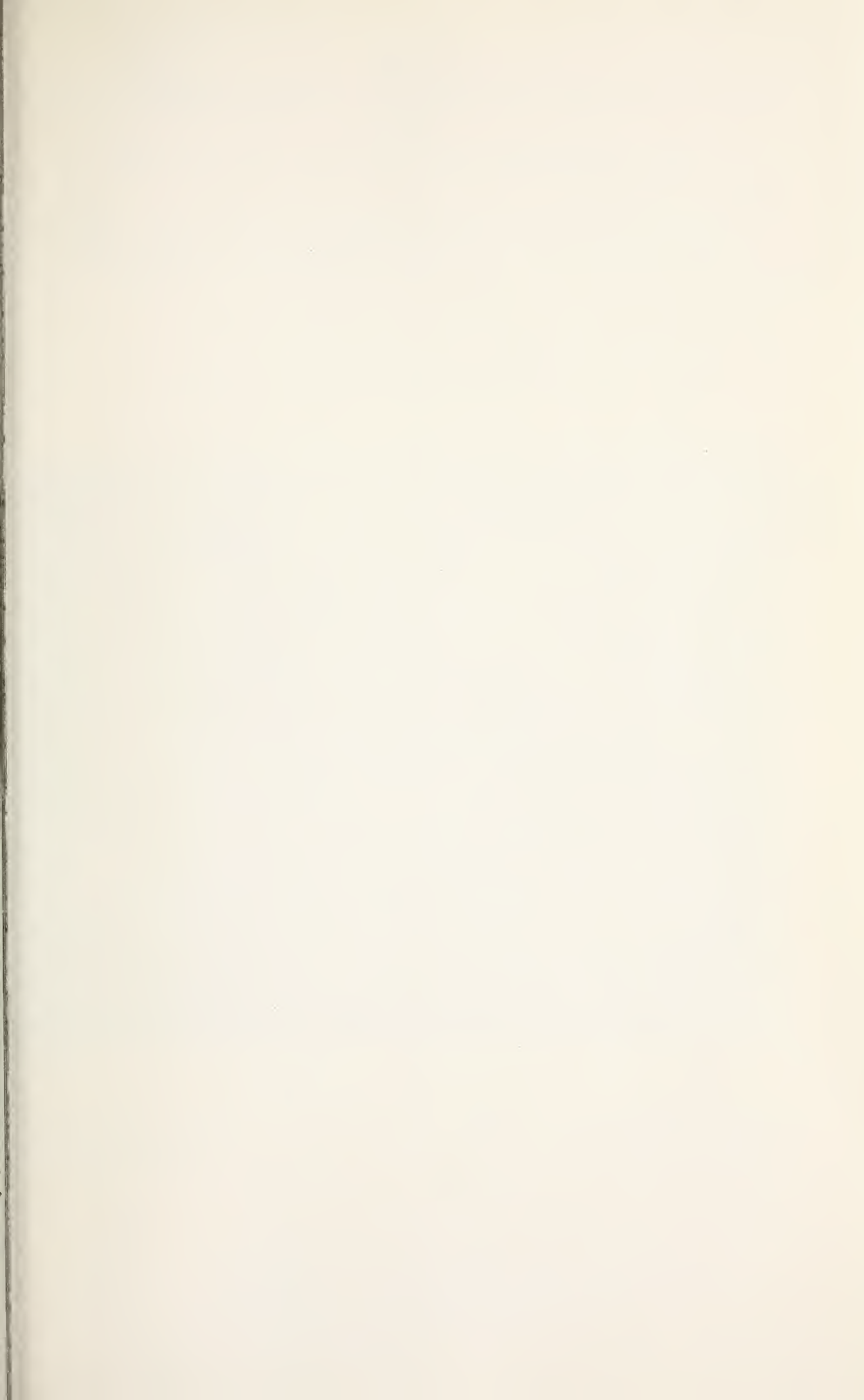
|                                                                                                                          |          |                 |
|--------------------------------------------------------------------------------------------------------------------------|----------|-----------------|
| B. Costs                                                                                                                 |          |                 |
| 1. Operating expenses                                                                                                    | \$19,300 |                 |
| 2. Depreciation @ 15 years                                                                                               | \$5,600  |                 |
| 3. Return on investment<br>@ 6% on 1/2 of the<br>original investment                                                     |          | 2,500           |
| 4. Total                                                                                                                 |          | <u>\$27,400</u> |
| C. Net surplus                                                                                                           |          | <u>\$2,300</u>  |
| IV. Details: Estimated funds required to finance costs of land,<br>buildings, equipment, construction, etc. <sup>1</sup> |          |                 |
| A. Cost of land                                                                                                          |          |                 |
| 1. 2 acres @ \$1,000                                                                                                     | \$2,000  |                 |
| 2. Title examination                                                                                                     | 200      |                 |
| 3. Total cost of land                                                                                                    |          | <u>\$2,200</u>  |
| B. Total building costs                                                                                                  | \$76,500 |                 |
| C. Other equipment                                                                                                       |          |                 |
| 1. Office                                                                                                                | \$ 900   |                 |
| 2. Grain grading                                                                                                         | 1,000    |                 |
| 3. Total                                                                                                                 |          | <u>\$ 1,900</u> |
| D. Escrowed interest and other<br>costs during construction                                                              |          |                 |
| 1. Escrowed interest                                                                                                     | \$ 1,200 |                 |
| 2. Administrative and legal cost                                                                                         | 1,500    |                 |
| 3. Total                                                                                                                 |          | <u>\$ 2,700</u> |
| E. Total funds required                                                                                                  | \$83,300 |                 |
| F. Equity capital                                                                                                        | \$41,600 |                 |
| G. Interest and principal payments<br>at 6% for 5 years remaining<br>cost                                                |          | \$9,900         |
| V. Details: Estimated construction and equipment costs                                                                   |          |                 |
| A. Estimated storage and related equipment costs                                                                         |          |                 |
| 1. Storage tanks, concrete staves, installed @<br>\$.35 per bushel                                                       | \$19,200 |                 |
| 2. Spouting and miscellaneous steel                                                                                      | 2,200    |                 |
| 3. Concrete foundation work                                                                                              | 10,000   |                 |
| 4. Scale, installed                                                                                                      | 5,500    |                 |
| 5. Elevator and equipment                                                                                                | 16,000   |                 |
| 6. Cleaner and drier                                                                                                     | 1,800    |                 |
| 7. Office                                                                                                                | 2,400    |                 |
| 8. Installing other equipment                                                                                            | 4,000    |                 |
| 9. Total                                                                                                                 |          | <u>\$61,100</u> |
| B. Site development costs                                                                                                |          |                 |
| 1. Grading, filling and<br>drainage                                                                                      | \$ 500   |                 |
| 2. Hard surface road, 400<br>sq. yds. @ \$3.25                                                                           | 1,300    |                 |
| 3. Railroad tracks                                                                                                       | 1,500    |                 |
| 4. Water system                                                                                                          | 400      |                 |
| 5. Total                                                                                                                 |          | <u>\$ 3,700</u> |
| C. Total construction costs                                                                                              | \$64,800 |                 |
| 1. 8% engineer's fee                                                                                                     | 5,200    |                 |
| 2. 10% reserve for contingencies                                                                                         | 6,500    |                 |
| 3. Total construction and equipment costs                                                                                |          | <u>\$76,500</u> |

<sup>1</sup>Related businesses such as cotton gins, feed mills and farm supply stores, usually operated jointly with local grain elevators, use some of the facilities jointly with the elevator operation. One systematic estimate would allocate about 10 percent of the above costs to such operations.

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93 *nutrient*

# The Nitrogen, Phosphorus and Potassium Contents of Sugar Cane in Louisiana

*Laron E. Golden and Ray Ricaud*



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Agricultural Experiment Station  
Charles W. Upp, Director

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# The Nitrogen, Phosphorus and Potassium Contents of Sugar Cane in Louisiana

LARON E. GOLDEN AND RAY RICAUD

In order to clearly understand the effect of growing sugar cane on the general fertility status of soils, it is necessary to determine the rates of removal of nutrients from the soil annually by the crop and the way these rates compare with rates of application of nutrients in fertilizers. All soils of Louisiana on which sugar cane is grown require annual applications of nitrogen, and many soils are so low in available phosphorus and potassium that they require annual applications of  $P_2O_5$  and  $K_2O$  for the production of profitable yields.

The degree of availability of N, P and K in soils is related to some extent to the total amounts of these nutrients in the soil. Most of the soil nitrogen is a constituent of the soil organic matter. Under Louisiana conditions only a small portion (about 3 per cent) of the soil organic matter decomposes during any growing season. During a normal year the nitrogen made available for crop use upon decomposition of soil organic matter is not sufficient in either total quantity or rate of release for optimum growth rate of sugar cane in Louisiana. The amount of total phosphorus in soils used for growing sugar cane in Louisiana is relatively low when compared with the rate of removal by sugar cane. The amount of total potassium in these soils is medium to high. The availability of potassium in many of the soils is either generally low or drops during the growing season to such a low level as to become a limiting factor in the growth of sugar cane.

With the present relatively optimistic world-wide outlook for sugar production and its favorable effect on the sugar industry in Louisiana, many sugar cane farmers are succession farming, or producing sugar cane on land continuously without including one year out of three or four for fallow or for the growing of a soil building crop. The effect of continuous cropping on the fertility status of soils may be estimated more accurately if the rates of removal of nutrients are known and compared with rates of supply of nutrients in fertilizers.

The dry matter and the nutrient composition of sugar cane are influenced by many external and internal factors. Differences in nutrient contents may be attributable to differences in variety (6, 9, 18)<sup>1</sup>, climate (1), soils (5, 6, 13, 16), fertilizer treatment (2, 3, 4, 11, 14, 15), age (1, 8, 17), competition from weeds (12), cultural practices (18) and season of growth following planting (6). Browne and Blouin (6), in 1907, stated that the ash content of sugar cane in Louisiana was found to vary widely according to the variety of cane, type of soil and manner of fertilization.

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<sup>1</sup>Italic numbers in parentheses refer to Literature Cited, Page 19.

They also reported that a comparison of many analyses made at Audubon Experiment Station on the leading varieties of cane showed that stubble cane contained from 10 per cent to 20 per cent less ash and over 50 per cent less nitrogen than plant cane. They attributed these differences to a partial depletion by plant cane of nutrients in the soil in which greatest root development and activity occurred.

## EXPERIMENTAL

### Soil and Plant Material

Fertilizer experiments in the field involving relatively large plots of approximately 0.1 acre each were conducted annually with sugar cane within the sugar cane area. One fertilizer test site on a Recent Mississippi terrace soil and one site on a Recent Mississippi alluvial soil were chosen during each of the years 1960, 1961 and 1962 for special sampling necessary for dry matter and nutrient composition study. General soil samples were taken from each site chosen for analysis.

#### *Fertilizer Treatments Sampled*

| Lbs./Acre, Applied                                | Lbs./Acre, Applied                                |
|---------------------------------------------------|---------------------------------------------------|
| N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O | N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O |
| 0-0-0                                             | 120-40-0                                          |
| 80-0-0                                            | 120-0-80*                                         |
| 120-0-0                                           | 120-40-80*                                        |

\*Only 60 pounds of K<sub>2</sub>O were used at the two 1960 sites.



FIGURE 1.—Whole-stool samples being weighed.



Whole-stool samples of cane weighing approximately 200 pounds were taken at harvest time from each of three replications of the six fertilizer treatments at each site. Samples consisted of all the plant parts above the ground. Samples were weighed and stalks cleaned and topped at the last hard joint. The millable cane was weighed and the weight of tops and trash was obtained by difference between weight of the entire sample and the weight of millable cane. The millable cane was crushed with a hand mill, the bagasse was weighed and the weight of the juice was obtained by the difference between weight of millable cane and weight of bagasse. The tops and trash and the bagasse were ground separately in a forage harvester. Tops and trash, bagasse and juice were sampled separately for N,  $P_2O_5$ ,  $K_2O$  and dry matter determinations. All analyses are reported on an oven-dry ( $60^\circ C.$ ) basis. The dry matter production and the uptake of each nutrient were calculated by using percentage contents of the different parts and total cane yield from each plot. The sum of composition of tops and trash, bagasse and juice was the composition for the total above-ground growth, and the sum of the composition of the bagasse and juice was the composition of the millable cane.



**FIGURE 2.**—Approximately 1,000 pounds of soil in the tubs and sack were required to produce the stool of cane shown.

Composition of the stubble and roots of sugar cane was approximated by collecting for analysis roots and stubble contained in the soil required to produce one stool of cane from the 80-0-0 treatment at each of the two sites used to collect above-ground cane samples in 1962.

Length of row required for each stool chosen was 20 inches. After the cane was cut at the ground line, soil with stubble and roots was taken along the 20-inch length of row to a depth of 20 inches at the row ridge and to a depth of 8 inches at the middles. In each case this involved approximately 1,000 pounds of soil, stubble and roots. Stubble and roots were separated from the soil by hand and by washing and screening the material several times. The soil collected at each location contained all of the stubble and approximately 90 per cent of all roots produced by each stool of cane. It is estimated that approximately 95 per cent of the stubble and roots contained in the soil taken were recovered for analysis.



**FIGURE 3.**—In this photograph the end of the rule is 30 inches below the row ridge. The photograph shows that most of the roots were no deeper than approximately 20 inches at the row ridge and 8 inches at the row middles.

For the determination of rates of dry matter production and uptake of nutrients during the growing season, above-ground production from 6-foot segments of rows within the 120-40-80 treatment was sampled three times, approximately four weeks apart, beginning in early June. Whole-stool samples were taken at harvest from the same treatment. Eleven sites were sampled during 1960, 1961 and 1962. March 15 was considered to be the average date for the beginning of cane growth and November 24 was the average harvest date.

### Soil and Plant Analysis Procedures

Soil samples were composited, air-dried and passed through a 2-mm. sieve. All plant samples other than juice were air-dried, ground to pass



1-mm. openings and oven-dried at 60° C. Nitrogen in the soil and in plant samples was determined by the modified Kjeldahl method. Carbon in soils was determined by the dry combustion method, and organic matter content was calculated by multiplying per cent carbon by 1.724. Soil pH was determined by use of a Beckman Zeromatic pH meter. The Beckman Model DU spectrophotometer, with flame attachment and photomultiplier assembly, was used to determine K, Ca and Mg in the soil samples and K in plant samples. The P in soil and plant samples was determined by the chlorostannous-reduced molybdophosphoric blue color method, in hydrochloric acid system. For the determination of available P, K, Ca and Mg all extractions were accomplished at 25° C. (10).

## RESULTS AND DISCUSSION

Results of analyses of soils used in the study are shown in Table 1. The data in Table 1 show that the average total nitrogen was higher in terrace soils than in the recent alluvial soils, but the averages of total phosphorus, available phosphorus, total potassium and available potassium in the terrace soils were lower than the averages from recent alluvial soils.

The data reported in Tables 3 and 4 for dry matter and nutrient contents of stubble and roots were obtained by applying the appropriate averages of ratios of below-ground to above-ground contents from the two plantations reported in Table 2 to above-ground data obtained from experimental sites reported in Tables 5 through 13. The average dry matter production in stubble and roots found at the two locations reported in Table 2 was 128 pounds per ton of millable cane. Results of similar work reported by Stubbs (18) in 1900, from work accomplished at the Audubon Experiment Station, show that an average stubble and root production by purple cane and striped cane was 124 pounds per ton of millable cane.

The distribution of dry matter contents of the three major portions of sugar cane is reported in Table 3. It may be noted from data in Table 3 that, in Louisiana, millable cane contained from 52 to 60 per cent of all dry matter produced by the plants, that tops and trash contained from 26 to 34 per cent and that stubble and roots contained from 12 to 16 per cent of the dry-matter content of the plants. These values differ very little from the contents shown in Table 3 which were reported by Halliday (14) as a result of his review of world data on the subject.

Table 4 contains world-wide data reported by Halliday (14) and Louisiana data concerning distribution of nutrients in the three major portions of sugar cane. The experimentally obtained value of 4.24 pounds of nitrogen in the Louisiana crop per ton of millable cane is higher than that reported as the world-wide average (4.04 pounds). This

TABLE 1.—Results of Chemical Analysis of Soils

|                           | Terrace soils |           |           |           | Recent alluvial soils |            |          |
|---------------------------|---------------|-----------|-----------|-----------|-----------------------|------------|----------|
|                           | Baldwin       | Cypremort |           | Baldwin   | Commerce              | Mhoon      | Commerce |
|                           | sil           | sil       |           | sil       | sil                   | sil        | sil      |
| Plantation                | O'Neil        | Alice "B" | Alice "B" | Alice "B" | Smithfield            | St. Thomas | Alma     |
| Reaction, pH              | 4.8           | 4.9       |           | 7.1       | 7.5                   | 6.7        | 5.6      |
| Organic matter, %         | 2.28          | 1.02      |           | 1.55      | 1.30                  | 1.38       | 1.18     |
| Total nitrogen, %         | 0.125         | 0.062     |           | 0.071     | 0.067                 | 0.068      | 0.064    |
| Total phosphorus, ppm     | 452           | 352       |           | 314       | 523                   | 619        | 504      |
| Available phosphorus, ppm | 30            | 31        |           | 82        | 297                   | 216        | 237      |
| Total potassium, %        | 1.95          | 1.60      |           | 1.65      | 2.04                  | 2.16       | 1.91     |
| Available potassium, ppm  | 155           | 47        |           | 66        | 85                    | 78         | 92       |
| Available calcium, ppm    | 1834          | 661       |           | 3228      | 2404                  | 1800       | 1174     |
| Available magnesium, ppm  | 649           | 171       |           | 598       | 623                   | 495        | 331      |

**TABLE 2.—The Dry Matter and Nutrient Contents of Sugar Cane Stubble and Roots as Related to Dry Matter and Nutrient Contents of Above-Ground Growth**

|                                         | Alma Plantation <sup>1</sup> |              |                   | Alice "B" Plantation <sup>2</sup> |              |                   |
|-----------------------------------------|------------------------------|--------------|-------------------|-----------------------------------|--------------|-------------------|
|                                         | Below ground                 | Above ground | Ratio Below/Above | Below ground                      | Above ground | Ratio Below/Above |
| Dry matter, tons/A.                     | 1.63                         | 11.72        | 0.14              | 2.84                              | 14.73        | 0.19              |
| Nitrogen, lbs./A.                       | 10.1                         | 105.0        | 0.10              | 24.4                              | 133.2        | 0.18              |
| P <sub>2</sub> O <sub>5</sub> , lbs./A. | 5.4                          | 36.9         | 0.15              | 9.3                               | 53.3         | 0.17              |
| K <sub>2</sub> O, lbs./A.               | 16.6                         | 184.0        | 0.09              | 27.3                              | 157.6        | 0.17              |

<sup>1</sup>Soil type, Commerce sil; variety, C.P. 52-68, plant cane; fertilizer treatment, 80-0-0; yield, 29.59 tons/A.

<sup>2</sup>Soil type, Baldwin sil; variety, N.Co. 310, plant cane; fertilizer treatment, 80-0-0; yield, 39.39 tons/A.

**TABLE 3.—Vegetative Composition of Sugar Cane - Dry Matter**

|                   | World-wide | Louisiana |
|-------------------|------------|-----------|
|                   | %          | %         |
| Millable cane     | 50-60      | 52-60     |
| Tops and trash    | 30-40      | 26-34     |
| Stubble and roots | 10         | 12-16     |

**TABLE 4.—Distribution of Nutrients Between Above-Ground Growth and Under-ground Portions of Sugar Cane**

|                   | World-wide                |                               |                  | Louisiana                 |                               |                  |
|-------------------|---------------------------|-------------------------------|------------------|---------------------------|-------------------------------|------------------|
|                   | N                         | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O | N                         | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O |
|                   | Lbs./ton of millable cane |                               |                  | Lbs./ton of millable cane |                               |                  |
| Millable cane     | 1.00                      | 1.00                          | 3.25             | 1.43                      | 0.83                          | 2.93             |
| Tops and trash    | 2.00                      | 1.00                          | 2.80             | 2.29                      | 0.64                          | 3.04             |
| Stubble and roots | 1.04                      | 0.45                          | 0.45             | 0.52                      | 0.24                          | 0.77             |
| Totals            | 4.04                      | 2.45                          | 6.50             | 4.24                      | 1.71                          | 6.74             |

may be due to the relatively short growing season of 8 to 9 months for sugar cane in Louisiana, as compared to growing seasons of 12 to 18 months and more elsewhere. The experimental values obtained in Louisiana ranged from a low of 3.13 pounds of N in the plants per ton of millable cane from the 0-0-0 treatment on Baldwin silt loam soil at Alice "B" Plantation, to a high of 5.59 pounds of N in the plants per ton of millable cane from the 80-0-0 treatment on Commerce silt loam soil at Smithfield Plantation.

The P<sub>2</sub>O<sub>5</sub> in the Louisiana crop in the amount of 1.71 pounds per ton of millable cane is less than the world-wide value reported in Table 4. The relative rate of uptake of P<sub>2</sub>O<sub>5</sub> by cane in Louisiana treated with

120-40-80 has been shown to lag somewhat behind that of nitrogen. The nitrogen-only treatments have also been shown to have a lower per cent of  $P_2O_5$  or diluting effect on phosphorus content of cane in Louisiana. These factors coupled with others, such as native soil fertility, variety, age of cane and length of growing season, may account for the differences in  $P_2O_5$  contents reported. The experimental values obtained ranged from a low of 1.31 pounds of  $P_2O_5$  per ton of millable cane from the 120-0-80 treatment on Commerce silt loam soil at Alma Plantation, to a high of 2.55 pounds of  $P_2O_5$  per ton of millable cane from the 0-0-0 treatment on Mhoon silt loam soil at St. Thomas Plantation.

Data in Table 4 show that an average of 6.74 pounds of  $K_2O$  has been found in the Louisiana sugar cane crop per ton of millable cane produced, which is 0.24 pound more than the world-wide value reported. The experimental values obtained ranged from a low of 4.47 pounds of  $K_2O$  per ton of millable cane from the 120-40-0 treatment on Cypremort silt loam soil at Alice "B" Plantation, to a high of 9.20 pounds of  $K_2O$  per ton of millable cane from the 120-40-60 treatment on Baldwin silty clay loam soil at O'Neil Plantation. Soil analyses reported in Table 1 show available K in the Cypremort silt loam soil to be 33 ppm and available K in the Baldwin silty clay loam soil to be 156 ppm, the lowest and highest values, respectively, of the six soils studied.

Data in Table 4 show that, on the average, 1.43 pounds of N, 0.83 pound of  $P_2O_5$  and 2.93 pounds of  $K_2O$  per ton of millable cane leave the fields of Louisiana. These values are for clean cane. In some cases where high amounts of trash are hauled from the fields with the cane, the quantities of primary nutrients leaving the fields per ton of millable cane may be as high as 2.75 pounds of N, 1.25 pounds of  $P_2O_5$  and 4.50 pounds of  $K_2O$ . If approximate averages of 2.0 pounds of N, 1.0 pound of  $P_2O_5$  and 3.5 pounds of  $K_2O$  leave the field per ton of millable cane for a 30-ton per acre crop, 60 pounds of N, 30 pounds of  $P_2O_5$  and 105 pounds of  $K_2O$  leave the field per acre each crop year.

Unpublished data obtained by the authors show that burning of cane trash results in loss of 90 per cent or more of N and little or no loss of  $P_2O_5$  and  $K_2O$  by volatilization. Use of N at the rate of 80 pounds per acre would provide N for the crop equivalent to the amount removed in the cane and trash and that normally lost by burning of trash from a 30-ton per acre crop. However, for the farmer to attempt to maintain a balance between N added to the soil and N lost from the soil, consideration needs to be given to possible gain of N in the soil from inoculated legume cover crops, from fixation of N in the soil by nonsymbiotic organisms and from N in rainfall and to possible loss of N from the soil due to leaching, runoff and oxidation and reduction processes resulting from biological activity in the soil.

Additional unpublished data obtained by the authors in studies with sugar cane involving use of the radio-isotope  $P^{32}$  show that applied fertilizer  $P_2O_5$  is not subject to leaching loss in greater than trace



amounts. To maintain a balance between  $P_2O_5$  lost from the soil and  $P_2O_5$  added, consideration needs to be given only to the anticipated yield and the amount of  $P_2O_5$  added in fertilizer or other material, since no appreciable net change in the amount of soil  $P_2O_5$  should occur. The mean annual removal of  $P_2O_5$  from soils used for growing sugar cane in this study was equivalent to approximately 1.4 per cent of the total  $P_2O_5$  in the top soil. At this rate of removal ten years of cropping would remove from the soil the equivalent of 14 per cent of the  $P_2O_5$  in the top soil. The amount of  $P_2O_5$  available to successive crops probably decreases at a faster rate than the amount of total soil  $P_2O_5$ . The rate of removal of  $P_2O_5$  from sugar cane soils in Louisiana annually is considered to be serious and is great enough to cause a depletion of soil  $P_2O_5$  within three of four decades, even in the more fertile soils.

If a 30-ton per acre crop results in removal from the field of 105 pounds of  $K_2O$ , there is obviously a net loss of  $K_2O$  from the field if less than 105 pounds of  $K_2O$  are applied. In addition, even though no loss of  $K_2O$  has been found to occur by volatilization during burning, soluble salts of potassium in the ashes are subject to loss by leaching and in run-off water. Even though the rate of removal of  $K_2O$  in cane from the field per acre is about 3.5 times the rate of removal of  $P_2O_5$  in cane, percentage of total soil  $P_2O_5$  removed in the cane is 6.1 times the percentage of total soil  $K_2O$  removed.

Tables 5 through 13 contain data which show the effect of fertilizer treatments on N,  $P_2O_5$  and  $K_2O$  contents of sugar cane at harvest. The averages of yields obtained are shown in Table 5 and are not repeated in the other tables.

In Table 5 it may be observed that the N in millable cane increased as the N-only treatments increased in rates from 0 to 120 pounds of N per acre. The correlation was statistically significant in the case of terrace soils and was highly significant in the case of recent alluvial soils.

TABLE 5.—The Effect of Fertilizer Treatment on N Content of Sugar Cane

| Fertilizer<br>treatment,<br>N- $P_2O_5$ - $K_2O$ | Terrace soils |                  |                              | Recent alluvial soils |                  |                              |
|--------------------------------------------------|---------------|------------------|------------------------------|-----------------------|------------------|------------------------------|
|                                                  | Cane<br>yield | N content        |                              | Cane<br>yield         | N content        |                              |
|                                                  |               | Millable<br>cane | Total<br>growth              |                       | Millable<br>cane | Total<br>growth              |
| Lbs./A.                                          | Tons/A.       | Lbs./ton         | Lbs./ton<br>millable<br>cane | Tons/A.               | Lbs./ton         | Lbs./ton<br>millable<br>cane |
| 0-0-0                                            | 25.00         | 1.13             | 3.48                         | 24.73                 | 0.97             | 3.58                         |
| 80-0-0                                           | 27.46         | 1.39             | 4.24                         | 28.10                 | 1.36             | 4.48                         |
| 120-0-0                                          | 28.61         | 1.58             | 4.46                         | 27.71                 | 1.50             | 4.40                         |
| 120-40-0                                         | 30.68         | 1.57             | 4.48                         | 28.49                 | 1.51             | 4.46                         |
| 120-0-80                                         | 29.76         | 1.58             | 4.21                         | 29.97                 | 1.53             | 4.41                         |
| 120-40-80                                        | 31.29         | 1.49             | 4.31                         | 30.02                 | 1.53             | 4.35                         |
| L.S.D. 0.05                                      | 2.45          | 0.26             | 0.61                         | 3.27                  | 0.11             | 0.39                         |

The N in the total growth also generally increased with the increase in rate of N applied except that the amount of N in the total growth per ton of millable cane was 0.08 pound less in the 120-0-0 treatment than in the 80-0-0 treatment on recent alluvial soils. The correlation in the case of terrace soils was statistically significant at the 1 per cent level of probability, but the correlation in the case of alluvial soils only approached significance at the 5 per cent level of probability. It may be noted that in the case of both terrace and recent alluvial soils, the amount of N in the total growth from the 120-40-80 treatment was less than the amount from the 120-0-0 treatment. These differences may be attributable to a tendency toward a balancing effect by phosphorus and potassium in the fertilizers on nitrogen uptake and utilization by the crop.

Analysis of data in Table 6 showed no significant relationships between total N in soils and N content of cane. Increases in N content of cane produced from the 120-0-0 treatment over the 0-0-0 treatment are shown in Table 6 to range from 0.19 pound to 1.41 pounds per ton of millable cane.

**TABLE 6.—The Relationship Between Total N in Soils and N Content of N-Treated and Non-N-Treated Sugar Cane**

| Soil type     | Plantation | Total<br>N | N content per ton of<br>millable cane |                      |                                           |
|---------------|------------|------------|---------------------------------------|----------------------|-------------------------------------------|
|               |            |            | Not<br>treated <sup>1</sup>           | Treated <sup>2</sup> | Increase due<br>to treatment <sup>3</sup> |
|               |            | %          | Lbs.                                  | Lbs.                 | Lbs.                                      |
| Cypremort sil | Alice "B"  | 0.062      | 4.07                                  | 4.26                 | 0.19                                      |
| Commerce sil  | Alma       | 0.064      | 3.29                                  | 4.15                 | 0.86                                      |
| Commerce sil  | Smithfield | 0.067      | 4.06                                  | 5.11                 | 1.05                                      |
| Mhoon sil     | St. Thomas | 0.068      | 3.37                                  | 3.93                 | 0.56                                      |
| Baldwin sil   | Alice "B"  | 0.071      | 3.13                                  | 4.48                 | 1.35                                      |
| Baldwin sil   | O'Neil     | 0.125      | 3.23                                  | 4.64                 | 1.41                                      |

<sup>1</sup>0-0-0 treatment.

<sup>2</sup>120-0-0 treatment.

<sup>3</sup>L.S.D. for mean increase in N = 0.34 lb. per ton of millable cane at the 5 per cent level of probability.

Data in Table 7 show that the total uptake of N per acre by cane from the N-only treatments on terrace soils increased as the rates of N in fertilizers increased. This relationship was statistically significant at the 1 per cent level of probability. The yield responses to N in fertilizers on the terrace soils were 2.46 and 3.61 tons of cane per acre from the 80-0-0 and the 120-0-0 treatments, respectively. The uptake of N and yield response were higher from the 80-0-0 treatment than from the 120-0-0 treatment on recent alluvial soils. The yield responses to N in fertilizers were considerably higher at the locations studied in 1960 and 1961 than they were at the locations studied in 1962, due primarily to the

TABLE 7.—The Effect of Fertilizer Treatment on N Content and Yield Response of Sugar Cane

| Fertilizer<br>treatment,<br>N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O | Terrace soils   |                        |                                   | Recent alluvial soils |                        |                                   |
|-------------------------------------------------------------------------------|-----------------|------------------------|-----------------------------------|-----------------------|------------------------|-----------------------------------|
|                                                                               | N in            |                        | Response<br>to N in<br>fertilizer | N in                  |                        | Response<br>to N in<br>fertilizer |
|                                                                               | all plant parts |                        |                                   | all plant parts       |                        |                                   |
|                                                                               | Total           | Increase<br>over check |                                   | Total                 | Increase<br>over check |                                   |
|                                                                               | Lbs./A.         | Lbs./A.                |                                   | Tons/A.               | Lbs./A.                |                                   |
| 0-0-0                                                                         | 87.0            | .....                  | .....                             | 88.8                  | .....                  | .....                             |
| 80-0-0                                                                        | 116.4           | 29.4                   | 2.46                              | 125.9                 | 37.1                   | 3.37                              |
| 120-0-0                                                                       | 127.6           | 40.6                   | 3.61                              | 121.9                 | 33.1                   | 2.98                              |
| L.S.D. 0.05                                                                   | 25.2            |                        |                                   | 17.8                  |                        |                                   |

severe drought which occurred in 1962. Returns on investment in N in fertilizers for sugar cane in Louisiana vary from \$3.00 to \$10.00 per \$1.00 invested.

In Table 7 it may be observed that the highest increase in N uptake due to fertilizer N, 40.6 pounds per acre, was obtained from the 120-0-0 treatment on terrace soils. Even though the increase in uptake of N was due to the fertilizer N, some of the increase in N absorbed probably came from soil N as a result of a more extensive root system. The increase in N uptake, 40.6 pounds per acre, is 34 per cent of the amount of N in the fertilizer treatment, 120 pounds per acre. This type of percentage value, however, may not be used in absolute terms as an efficiency value, because of the additional soil N that may be absorbed as a result of an expanded root system and because of possible luxury consumption where P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O are not used in the fertilizers to minimize any tendency toward luxury consumption.

Tables 8, 9 and 10 show the effect of P<sub>2</sub>O<sub>5</sub> in fertilizers on P<sub>2</sub>O<sub>5</sub> content of sugar cane. It may be noted in Table 8 that nitrogen in fertilizers had a general lowering or dilution effect on P<sub>2</sub>O<sub>5</sub> in sugar cane. This effect was highly significant in the case of terrace soils but was nonsignificant in the case of recent alluvial soils. Table 9 shows that treatment with P<sub>2</sub>O<sub>5</sub> had no consistent relationship to P<sub>2</sub>O<sub>5</sub> content of cane. The effects of treatment with P<sub>2</sub>O<sub>5</sub> over the untreated were not associated significantly with chemical soil test values for available P. Data in Table 10, however, show that sugar cane yield responses to P<sub>2</sub>O<sub>5</sub> in the fertilizers ranged from a statistically nonsignificant amount of 0.05 ton of cane per acre for the 120-40-80 treatment over the 120-0-80 treatment on recent alluvial soils, to a statistically highly significant amount of 2.07 tons of cane per acre for the 120-40-0 treatment over the 120-0-0 treatment on terrace soils.

Lower yield responses to P<sub>2</sub>O<sub>5</sub> in fertilizers in the dry year 1962 caused average responses shown in Table 10 to be lower than average responses during the years 1960 and 1961. The cost of 40 pounds of P<sub>2</sub>O<sub>5</sub> per acre in fertilizers used for sugar cane and cost of application are

TABLE 8.—The Effect of Fertilizer Treatment on  $P_2O_5$  Content of Sugar Cane

| Fertilizer treatment,<br>N- $P_2O_5$ - $K_2O$ | $P_2O_5$ content of cane on terrace soils |                        | $P_2O_5$ content of cane on recent alluvial soils |                        |
|-----------------------------------------------|-------------------------------------------|------------------------|---------------------------------------------------|------------------------|
|                                               | Millable cane                             | Total growth           | Millable cane                                     | Total growth           |
| Lbs./A.                                       | Lbs./ton                                  | Lbs./ton millable cane | Lbs./ton                                          | Lbs./ton millable cane |
| 0-0-0                                         | 1.10                                      | 2.01                   | 1.20                                              | 2.19                   |
| 80-0-0                                        | 0.80                                      | 1.71                   | 0.73                                              | 1.66                   |
| 120-0-0                                       | 0.70                                      | 1.55                   | 0.85                                              | 1.75                   |
| 120-40-0                                      | 0.71                                      | 1.55                   | 0.77                                              | 1.64                   |
| 120-0-80                                      | 0.72                                      | 1.52                   | 0.79                                              | 1.65                   |
| 120-40-80                                     | 0.79                                      | 1.67                   | 0.78                                              | 1.64                   |
| L.S.D. 0.05                                   | 0.05                                      | 0.25                   | 0.28                                              | 0.49                   |

TABLE 9.—The Relationship Between Available P in Soils and  $P_2O_5$  Content of  $P_2O_5$ -Treated and Non- $P_2O_5$ -Treated Sugar Cane

| Soil type     | Plantation | Available P | $P_2O_5$ content per ton of millable cane |                      |                                        |
|---------------|------------|-------------|-------------------------------------------|----------------------|----------------------------------------|
|               |            |             | Not treated <sup>1</sup>                  | Treated <sup>2</sup> | Increase due to treatment <sup>3</sup> |
|               |            | ppm         | Lbs.                                      | Lbs.                 | Lbs.                                   |
| Baldwin sil   | O'Neil     | 30          | 1.66                                      | 1.96                 | 0.30                                   |
| Cypremort sil | Alice "B"  | 31          | 1.57                                      | 1.47                 | -0.10                                  |
| Baldwin sil   | Alice "B"  | 82          | 1.37                                      | 1.39                 | 0.02                                   |
| Mhoon sil     | St. Thomas | 216         | 1.84                                      | 1.43                 | -0.41                                  |
| Commerce sil  | Alma       | 237         | 1.35                                      | 1.42                 | 0.07                                   |
| Commerce sil  | Smithfield | 297         | 1.90                                      | 2.05                 | 0.15                                   |

<sup>1</sup>Average of 120-0-0 and 120-0-80 treatments.

<sup>2</sup>Average of 120-40-0 and 120-40-80 treatments.

<sup>3</sup>Mean increase in  $P_2O_5$  content was nonsignificant at the 5 per cent level of probability.

TABLE 10.—The Effect of Fertilizer Treatment on  $P_2O_5$  Content and Yield Response of Sugar Cane

| Fertilizer treatment,<br>N- $P_2O_5$ - $K_2O$ | Terrace soils               |                     |                                    | Recent alluvial soils       |                     |                                    |
|-----------------------------------------------|-----------------------------|---------------------|------------------------------------|-----------------------------|---------------------|------------------------------------|
|                                               | $P_2O_5$ in all plant parts |                     | Response to $P_2O_5$ in fertilizer | $P_2O_5$ in all plant parts |                     | Response to $P_2O_5$ in fertilizer |
|                                               | Total                       | Increase over check |                                    | Total                       | Increase over check |                                    |
|                                               | Lbs./A.                     | Lbs./A.             | Tons/A.                            | Lbs./A.                     | Lbs./A.             | Tons/A.                            |
| 120-0-0                                       | 44.3                        | ....                | ....                               | 48.5                        | ....                | ....                               |
| 120-40-0                                      | 47.6                        | 3.3                 | 2.07                               | 46.7                        | -1.8                | 0.78                               |
| 120-0-80                                      | 45.2                        | ....                | ....                               | 49.5                        | ....                | ....                               |
| 120-40-80                                     | 52.2                        | 7.0                 | 1.53                               | 49.2                        | -0.3                | 0.05                               |
| L.S.D. 0.05                                   | N.S.                        |                     |                                    | N.S.                        |                     |                                    |



equivalent to the value of approximately one-half ton of sugar cane. A one-ton yield response to 40 pounds of  $P_2O_5$  per acre in fertilizers is equivalent to a return of approximately \$2.00 per \$1.00 invested. The Louisiana Agricultural Experiment Station normally recommends use of  $P_2O_5$  on sugar cane when it consistently increases cane yields by one ton per acre.

In Table 10 it may be noted that the highest increase of  $P_2O_5$  uptake over the check treatment, 7.0 pounds per acre, was obtained from the 120-40-80 treatment on terrace soils. Data in Table 10 show that the uptake of  $P_2O_5$  by cane was not influenced as much by  $P_2O_5$  in fertilizers as N uptake, shown in Table 7, and  $K_2O$  uptake, shown in Table 13, were influenced by N and  $K_2O$  in fertilizers. Chemical, physical and biological processes which occur in soils and plants apparently

TABLE 11.—The Effect of Fertilizer Treatment on  $K_2O$  Content of Sugar Cane

| Fertilizer treatment,<br>N- $P_2O_5$ - $K_2O$<br>Lbs./A. | $K_2O$ content of cane<br>on terrace soils |                              | $K_2O$ content of cane<br>on recent alluvial soils |                              |
|----------------------------------------------------------|--------------------------------------------|------------------------------|----------------------------------------------------|------------------------------|
|                                                          | Millable<br>cane                           | Total<br>growth              | Millable<br>cane                                   | Total<br>growth              |
|                                                          | Lbs./ton                                   | Lbs./ton<br>millable<br>cane | Lbs./ton                                           | Lbs./ton<br>millable<br>cane |
| 0-0-0                                                    | 3.41                                       | 7.15                         | 3.96                                               | 8.24                         |
| 80-0-0                                                   | 2.48                                       | 6.05                         | 2.88                                               | 6.87                         |
| 120-0-0                                                  | 2.28                                       | 5.64                         | 2.72                                               | 6.54                         |
| 120-40-0                                                 | 2.39                                       | 5.93                         | 2.73                                               | 6.64                         |
| 120-0-80                                                 | 2.90                                       | 6.40                         | 3.23                                               | 7.34                         |
| 120-40-80                                                | 2.90                                       | 6.72                         | 3.12                                               | 7.37                         |
| L.S.D. 0.05                                              | 0.66                                       | 0.74                         | 0.59                                               | 0.71                         |

TABLE 12.—The Relationship Between Available K in Soils and  $K_2O$  Content of  $K_2O$ -Treated and Non- $K_2O$ -Treated Sugar Cane

| Soil type     | Plantation | Available<br>K | $K_2O$ content per ton<br>of millable cane |                      |                                           |
|---------------|------------|----------------|--------------------------------------------|----------------------|-------------------------------------------|
|               |            |                | Not<br>treated <sup>1</sup>                | Treated <sup>2</sup> | Increase due<br>to treatment <sup>3</sup> |
|               |            | ppm            | Lbs.                                       | Lbs.                 | Lbs.                                      |
| Cypremort sil | Alice "B"  | 47             | 4.63                                       | 5.50                 | 0.87                                      |
| Baldwin sil   | Alice "B"  | 66             | 5.05                                       | 5.45                 | 0.40                                      |
| Mhoon sil     | St. Thomas | 78             | 5.27                                       | 5.81                 | 0.54                                      |
| Commerce sil  | Smithfield | 85             | 8.10                                       | 8.69                 | 0.59                                      |
| Commerce sil  | Alma       | 92             | 7.41                                       | 7.58                 | 1.17                                      |
| Baldwin sil   | O'Neil     | 155            | 7.66                                       | 8.73                 | 1.07                                      |

<sup>1</sup>Average of 120-0-0 and 120-40-0 treatments.

<sup>2</sup>Average of 120-0-80 and 120-40-80 treatments.

<sup>3</sup>L.S.D for mean increase in  $K_2O$  = 0.46 lb. per ton of millable cane at the 5 per cent level of probability.

interact in such a way as to allow relatively less uptake of applied  $P_2O_5$  than uptakes of applied N and  $K_2O$ .

Tables 11, 12 and 13 show the effect of  $K_2O$  in fertilizers on  $K_2O$  content of sugar cane. Data in Table 11 show that the  $K_2O$  content in millable cane and in the total growth decreased as the N in the N-only treatments increased from 0 to 120 pounds of N per acre. This relationship was statistically significant in each case shown in Table 11. It may be further noted in Table 11 that the 120-40-0 and 120-0-80 treatments on both terrace and recent alluvial soils had a positive effect on the amount of  $K_2O$  in the millable cane and in the total growth when compared to the 120-0-0 treatment. The  $K_2O$  content of total growth on the 120-40-80 treatment on both terrace and bottom soils, however, was greater than on any of the other treatments at the 120-pound level of N.

Data in Table 12 show the high degree of positive correlation between available K in the soils studied and  $K_2O$  content of cane grown on both  $K_2O$ -treated and non- $K_2O$ -treated areas. The statistically significant correlations clearly show that soil K and fertilizer K are absorbed with relative ease. Some absorption in luxury quantities may occur under conditions of high amounts of available K in soils or applied fertilizer K. The correlations also confirm the high degree of reliability in the soil testing method for available K in the soils. The data in Table 12 show that the increase in  $K_2O$  in millable cane due to applied fertilizer  $K_2O$  ranged from 0.40 pound to 1.17 pounds per ton of millable cane.

It may be observed in Table 13 that the greatest increases over check of  $K_2O$  uptake, 38.8 pounds of  $K_2O$  per acre, and yield, 2.26 tons per acre, were found from the 120-0-80 treatment on recent alluvial soils. The cost of 80 pounds of  $K_2O$  per acre in fertilizers used for sugar cane and cost of application are equivalent to the value of approximately one-half ton of sugar cane. A one-ton yield response to 80 pounds of  $K_2O$  per acre in fertilizers is equivalent to a return of approximately \$2.00

TABLE 13.—The Effect of Fertilizer Treatment on  $K_2O$  Content and Yield Response of Sugar Cane

| Fertilizer treatment,<br>N- $P_2O_5$ - $K_2O$ | Terrace soils                |                        |                                        | Recent alluvial soils        |                        |                                        |
|-----------------------------------------------|------------------------------|------------------------|----------------------------------------|------------------------------|------------------------|----------------------------------------|
|                                               | $K_2O$ in<br>all plant parts |                        | Response<br>to $K_2O$ in<br>fertilizer | $K_2O$ in<br>all plant parts |                        | Response<br>to $K_2O$ in<br>fertilizer |
|                                               | Total.                       | Increase<br>over check |                                        | Total                        | Increase<br>over check |                                        |
|                                               | Lbs./A.                      | Lbs./A.                | Tons/A.                                | Lbs./A.                      | Lbs./A.                | Tons/A.                                |
| 120-0-0                                       | 161.4                        | ....                   | ....                                   | 181.2                        | ....                   | ....                                   |
| 120-0-80                                      | 190.5                        | 29.1                   | 1.15                                   | 220.0                        | 38.8                   | 2.26                                   |
| 120-40-0                                      | 181.9                        | ....                   | ....                                   | 189.2                        | ....                   | ....                                   |
| 120-40-80                                     | 210.3                        | 28.4                   | 0.61                                   | 221.2                        | 32.0                   | 1.53                                   |
| L.S.D. 0.05                                   | 21.1                         |                        |                                        | 27.4                         |                        |                                        |

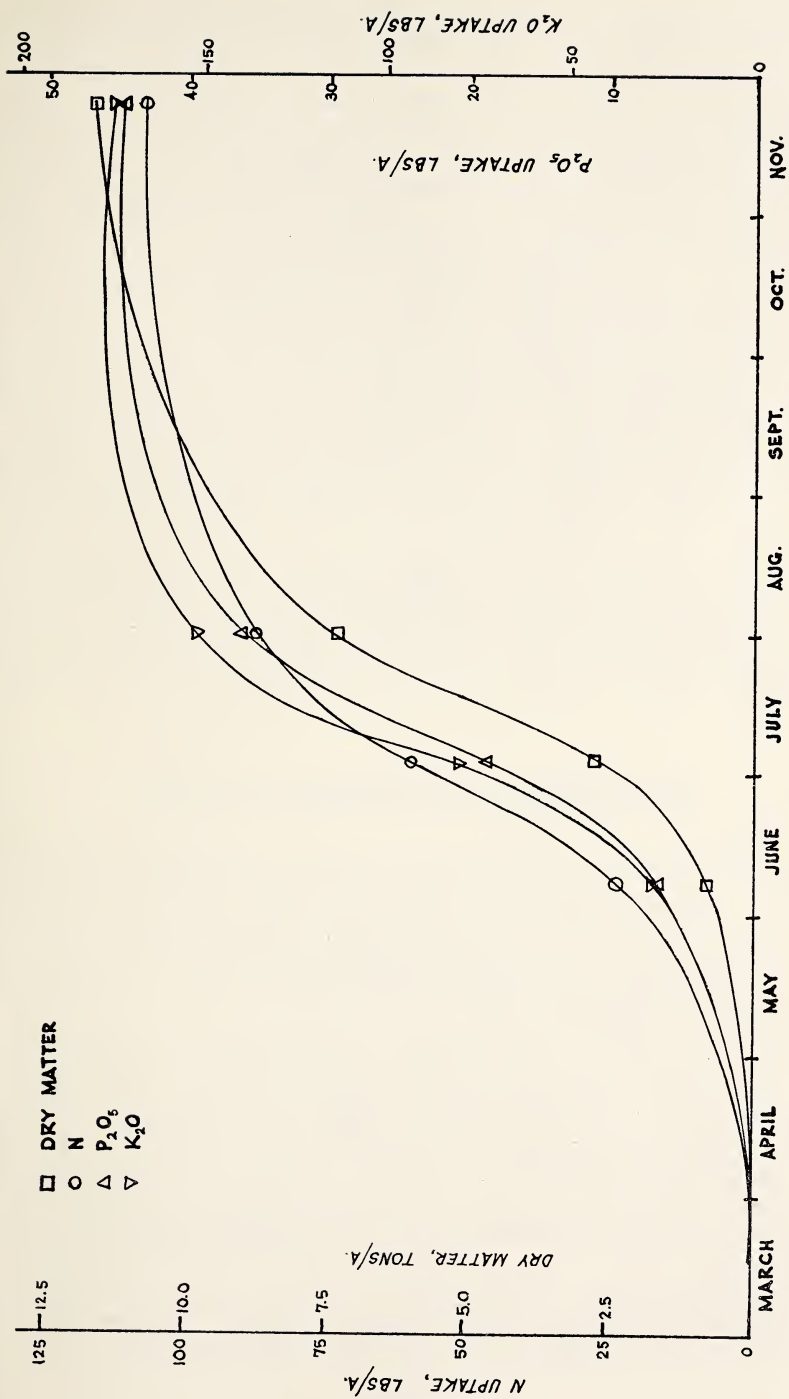


FIGURE 4.—The production of dry matter and the uptake of N,  $P_2O_5$  and  $K_2O$  during the growing season.

per \$1.00 invested. Recommendation for use of  $K_2O$  in fertilizers is normally made when consistent yield responses of one ton of cane per acre are obtained from  $K_2O$  in fertilizers.

The curves in Figure 4 show rates of production of dry matter and rates of uptake of N,  $P_2O_5$  and  $K_2O$  by above-ground parts of sugar cane in Louisiana. Points on the curves are averages based on data obtained from the 120-40-80 treatment at 11 experimental sites during 1960, 1961 and 1962. Average yield for the treatment was 28.82 tons of cane per acre. The curve in Figure 4 indicating rates of production of dry matter shows that production continues throughout the growing season. Early in the growing season nutrients were absorbed at rates relatively faster than rates of dry matter production, but near the end of the season dry matter production continued after little or no additional nutrients were absorbed. It may be noted from the curves in Figure 4 that the relative rates of absorption of N were greater than the rates of absorption of  $P_2O_5$  and  $K_2O$  during April and May. Relative rates of absorption of the three nutrients were approximately equal during June, but during July and August relatively more  $P_2O_5$  and  $K_2O$  were absorbed than N.

Inspection of the curves in Figure 4 shows that approximately 40 per cent of the dry matter production occurred during July. During the three-month period June, July and August, approximately 75 per cent of the N, 82 per cent of the  $P_2O_5$  and 85 per cent of the  $K_2O$  were absorbed.

## SUMMARY AND CONCLUSIONS

A study was made of the dry matter production and the uptake of N, P and K by sugar cane. It was found that the average amounts of nutrients in the entire growth, including roots, per ton of millable cane were 4.24 pounds of N, 1.71 pounds of  $P_2O_5$  and 6.74 pounds of  $K_2O$ .

It was concluded that approximately 2.0 pounds of N, 1.0 pound of  $P_2O_5$  and 3.5 pounds of  $K_2O$  leave the sugar cane fields in the cane and trash per ton of millable cane.

The amount of N removed each cropping year in cane and trash plus the amount normally lost by burning trash from a 30-ton per acre yield is approximately 80 pounds of N per acre. To maintain a balance between N lost from the soil and N added, full consideration must be given to gain of N in the soil from fixation of N by nonsymbiotic soil organisms, to gain from rainfall, to loss due to leaching, to loss in runoff water and to loss from oxidation and reduction processes which occur in the soil.

A general increase of N in the crop was found as the rate of N in N-only treatments increased. Some tendency toward a balancing effect by  $P_2O_5$  and  $K_2O$  in fertilizers on the N uptake was noted.



Nitrogen in N-only fertilizers had a general lowering or dilution effect on  $P_2O_5$  in sugar cane. Additions of  $P_2O_5$  to the fertilizers resulted in yield responses to  $P_2O_5$  in the fertilizers but did not cause consistent differences in  $P_2O_5$  content of sugar cane. It was concluded that the amount of  $P_2O_5$  in the soil can be maintained by additions of  $P_2O_5$  to the soil in amounts equal to amounts removed in the millable cane and trash. It was further noted that the total amount of  $P_2O_5$  in some soils cropped to sugar cane is seriously low when compared to the rate of removal by the sugar cane crop. Even in the more fertile soils  $P_2O_5$  may become depleted within three or four decades.

The  $K_2O$  content of sugar cane was found to decrease as the N in the N-only fertilizer treatments increased. Additions of  $K_2O$  to the fertilizers resulted in relatively consistent increases in yields and in  $K_2O$  content of sugar cane. The amount of  $K_2O$  removed each cropping year in cane and trash by a 30-ton per acre yield was found to be approximately 105 pounds. The total amount of  $K_2O$  in soils cropped to sugar cane was found to be medium or high. However, the amount of available K was found generally to be too low for optimum yields.

Early in the growing season rates of absorption of nutrients studied were found to be relatively faster than rates of production of dry matter, but near the end of the season dry matter production continued after little or no additional nutrients were absorbed. During the three-month period June, July and August, approximately 75 per cent of the N, 82 per cent of the  $P_2O_5$  and 85 per cent of the  $K_2O$  were absorbed.

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# CONSUMER PREFERENCE FOR EGGS

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In addition to giving results this report also puts some emphasis on the methods used in the research.



# Consumer Preference for Eggs

JAMES C. MANESS, E. P. ROY,  
B. H. DAVIS, AND B. E. WILLIAMSON<sup>1</sup>

## Introduction

In the last few years, consumer preference studies have gained acceptance in informing suppliers about consumer desires. The number of consumer preference studies for eggs conducted in Southern cities has been limited. Since the South is increasing egg production and marketing more of them in local markets, there is a need to ascertain the nature of consumer preferences for eggs in Southern cities. This publication reports the procedure and results of such a study conducted in Baton Rouge and New Orleans, Louisiana, in 1961.

## Objectives of the Study

The specific objectives of this study were: (1) to determine the egg grade preference of consumers in Baton Rouge, Louisiana, (2) to determine the egg grade and size preferences of consumers in New Orleans, Louisiana, and (3) to evaluate experimental methods of consumer testing.

## Review of Literature

When official U.S.D.A. grade color photographs were used by Jasper in Columbus, Ohio, the consumers' first choices were Grade AA, 54 per cent; Grade A, 16 per cent; Grade B, 10 per cent; and Grade C, 20 per cent (1952). Similar results were obtained by Slocum and Swanson from photographs used in Seattle, Washington, except that Grade AA was placed first 75 per cent of the time (1954). Consumers in Spokane, Washington, placed Grade AA first 66 per cent and Grade A 24 per cent of the time, as reported by Stadelman in 1957 (Table 1).

Kohls and Oppenheimer used actual eggs to test consumers' preference for quality in Indiana. They reported that Grade A was chosen 62 per cent of the time over B and C (1953). Bender and Voss found similar results in St. Louis (1959). Baker and Goldman reported consumers' first selection as Grade AA, 39 per cent; Grade A, 18 per cent; Grade B, 4 per cent; and Grade C, 39 per cent (1951). When Noles used a concentrated interview technique in households, he concluded that housewives could rank egg grades in order of AA, A, B, and C (1960).

---

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TABLE 1.—Results from Consumer Preference Studies of Egg Grades, 1952-1961

| Researchers                      | Area         | Method of testing | First choice distribution |                              |                 |    |
|----------------------------------|--------------|-------------------|---------------------------|------------------------------|-----------------|----|
|                                  |              |                   | AA                        | A                            | B               | C  |
| Jasper <sup>a</sup>              | Ohio         | Photographs       | 54                        | 16                           | 10              | 20 |
| Solcum & Swanson <sup>b</sup>    | Washington   | Photographs       | 75                        | 15                           | 10 <sup>1</sup> |    |
| Stadelman <sup>c</sup>           | Washington   | Photographs       | 66                        | 24                           | 6               | 4  |
| Kohls & Oppenheimer <sup>d</sup> | Indiana      | Actual eggs       | ..                        | 62                           | ..              | .. |
| Bender & Voss <sup>e</sup>       | Missouri     | Actual eggs       |                           | Ranked in order <sup>2</sup> |                 |    |
| Baker & Goldman <sup>f</sup>     | Pennsylvania | Actual eggs       | 39                        | 18                           | 4               | 39 |
| Noles <sup>g</sup>               | Illinois     | Actual eggs       | 53                        | Ranked in order <sup>2</sup> |                 |    |
| Stadelman <sup>c</sup>           | Washington   | Models            | 53                        | 38                           | 2               | 7  |
| Baker & Thacker <sup>h</sup>     | New York     | Models            |                           | Ranked in order <sup>2</sup> |                 |    |
| Ellis <sup>i</sup>               | Canada       | Models            | 59                        | 34                           | 7 <sup>1</sup>  |    |
| Unweighted Average               |              |                   | 58                        | 29                           | 8               | 18 |

<sup>1</sup>Grades B and C combined.

<sup>2</sup>Preferences reported as AA, A, B, and C with no percentages given.

<sup>a</sup>Jasper, A. William, and Raymond E. Cray, 1953. Consumer preferences, practices and demands in purchasing eggs. Ohio Agricultural Experiment Station Bulletin 736.

<sup>b</sup>Slocum, Walter L., and Howard S. Swanson, 1954. Egg consumption habits, purchasing patterns, and preferences of Seattle consumers. Washington Agricultural Experiment Station Bulletin 556.

<sup>c</sup>Stadelman, W. J., et. al., 1956. Egg preferences of Spokane consumers. Poultry Science 35:596-601.

<sup>d</sup>Kohls, R. L., and Norman Oppenheimer, 1953. Quality recognition and purchasing habits of egg consumers. Purdue Agricultural Experiment Station Bulletin 592.

<sup>e</sup>Bender, L. D., and Leonard A. Voss, 1959. A comparison of single and multiple stimulus techniques of determining visual preference for eggs. Missouri Agricultural Experiment Station Bulletin 718.

<sup>f</sup>Baker, Ralph L., and Alan S. Goldman, 1951. Egg consumer's habits, preferences, and demands. Poultry Science 30:329-338.

<sup>g</sup>Noles, Richard Kenneth, 1960. Consumer egg preferences and their relationship to federal standards. (Thesis). University of Illinois.

<sup>h</sup>Baker, Robert C., and Glenn Thacker, 1959. What do New York State consumers know about egg quality? Poultry Science 38:1187-1190.

<sup>i</sup>Ellis, F. E., 1961. Consumer ideas about egg quality. Canadian Poultry Review, March, 1961.

When plastic models of eggs were used along with photographs in the Spokane study, comparable results were obtained. The Spokane consumers selected the plastic replicas of Grade AA, 53 per cent of the time and Grade A, 38 per cent. In a quality recognition test with plastic models at the New York State Fair, Baker and Thacker reported that 82 per cent of the females and 72 per cent of the males ranked Grades A, B, and C in order (1959). The formal education level indicated that people with grade school, high school, and college education ranked

the grades in proper order, or A, B, and C. The group that more correctly identified the ranking was females under 35 years of age with a college education (90 per cent). In a study by Ellis at the Canadian Fair, 59 per cent of the people chose Grade AA and 34 per cent selected Grade A as first choice (1961).

## **Consumer Preference for Interior Grades of Eggs in Baton Rouge**

### **Methodology**

To conduct the consumer preference tests in Baton Rouge, three grocery supermarkets were selected for their location: one each in a relatively low, middle, and high income neighborhood. The low income market was characterized by predominantly unskilled Negro clientele. The middle income store was patronized mostly by professional and skilled groups. Professional people made up a large segment of the customers of the high income supermarket.

Plastic models of broken-out eggs were used in determining consumer preference for interior grades of eggs (Figure 1). The yolks of the egg models were ideally shaped to correspond with the albumen height. The use of plastic models allowed control over more variables than would have been true for real eggs. Exterior factors such as cleanliness, soundness of shell, and shape of egg were not considered in this test.

The use of plastic models has several advantages over freshly broken-out eggs. With real eggs, there are variations in color and shape of yolk, mottling, clearness of albumen, size of chalazae, and shape of albumen. With cooked eggs the same problems exist as with real eggs, plus variation in cooking. Also, when cooked eggs are displayed, Grade A eggs usually keep their freshly cooked appearance for several hours, but the lower grade eggs usually "sag" within the hour. Thus, discrimination in a consumer test is placed on the lower grades unless egg displays are changed often. Also, the chalazae cannot be seen after the egg is cooked. Real eggs had to be used in the New Orleans test (discussed later) because size was a desired test variable and different size models were not available.

The tests in each of the three supermarkets were conducted for one week each on Thursdays, Fridays, and Saturdays. The personal interview technique was used in this study. Approximately the same number of interviews was conducted each day. When prospective respondents were approached, they were asked to participate in a consumer survey to see which egg (model) they liked best. No mention of grade was made by the interviewer and no questions by consumers were answered until the



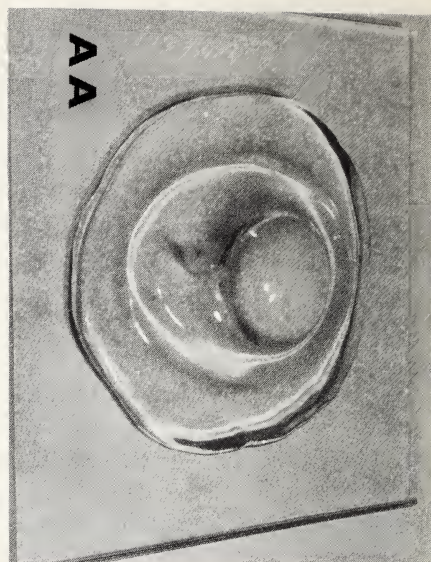


FIGURE 1.—Plastic models of U.S.D.A. egg Grades AA, A, B, and C. Egg size does not vary in these models.



questionnaire was completed. The positions of the egg models were changed frequently to help reduce positional bias.

The consumers interviewed were substantially all who passed by the egg model display, which was located in the main aisle of traffic in the stores. About three minutes were required for each interview.

## Results of the Study

### Characteristics of Respondents

The specific occupation of the wage earner was recorded during the interview and later grouped into general occupational categories for analysis. The general occupational groupings were (1) professional and white collar, (2) skilled, (3) unskilled, and (4) retired or unemployed (Table 2). Professional and white collar workers comprised over half of the sample. The smallest percentage of respondents was in the unskilled group. Most of the unemployed group were accounted for by university students.

The predominant groups were over 35 years of age, white, professional, and reared in an urban area. Eighty-five per cent of the shoppers were female. The average education level was high, 90 per cent having

**TABLE 2.—Characteristics of the Consumer Sample, Egg Preference Study, Baton Rouge, August, 1961**

| Characteristics of respondents | Number | Per cent | Characteristics of respondents | Number | Per cent |
|--------------------------------|--------|----------|--------------------------------|--------|----------|
| Occupation:                    |        |          | Background:                    |        |          |
| Professional and white collar  | 298    | 58.4     | Rural                          | 166    | 32.6     |
| Skilled                        | 81     | 15.9     | Urban                          | 344    | 67.4     |
| Unskilled                      | 45     | 8.8      |                                |        | 100.0    |
| Retired or unemployed          | 86     | 16.9     | Education:                     |        |          |
|                                |        | 100.0    | 0 - 4 years                    | 11     | 2.2      |
| Age:                           |        |          | 5 - 8 years                    | 40     | 7.8      |
| Under 25 years                 | 52     | 10.2     | 9 - 12 years                   | 191    | 37.4     |
| 25 - 34 years                  | 96     | 18.8     | Some college                   | 94     | 18.4     |
| 35 - 49 years                  | 181    | 35.5     | College degree                 | 169    | 33.2     |
| 50 years or more               | 181    | 35.5     | Unclassified                   | 5      | 1.0      |
|                                |        | 100.0    |                                |        | 100.0    |
| Race:                          |        |          | Family income (dollars):       |        |          |
| Negro                          | 88     | 17.0     | Below 2,000                    | 9      | 1.8      |
| White                          | 422    | 83.0     | 2,000 - 3,999                  | 45     | 8.9      |
|                                |        | 100.0    | 4,000 - 5,999                  | 73     | 14.3     |
| Sex:                           |        |          | 6,000 - 7,999                  | 50     | 9.8      |
| Male                           | 79     | 15.5     | 8,000 - 9,999                  | 71     | 13.9     |
| Female                         | 431    | 84.5     | 10,000 or more                 | 164    | 32.2     |
|                                |        | 100.0    | Unclassified                   | 17     | 3.3      |
|                                |        |          | Retired or unemployed          | 81     | 15.8     |
|                                |        |          |                                |        | 100.0    |

TABLE 3.—Preference for Grades of Eggs, Baton Rouge, August, 1961<sup>1</sup>

| Grade | Consumer placings |            |           |            | No preference |
|-------|-------------------|------------|-----------|------------|---------------|
|       | First             | Second     | Third     | Fourth     |               |
|       | Number            |            |           |            |               |
| AA    | 136               | 92         | 126       | 150        | 6             |
| A     | <u>176</u>        | 240        | 81        | 11         | 1             |
| B     | 156               | <u>126</u> | 214       | 12         | 2             |
| C     | 42                | 50         | <u>80</u> | <u>331</u> | 7             |

<sup>1</sup>Underscores indicate expected choice by consumers.

at least nine years of school. At least half of the respondents had a family annual income of over \$6,000.

### Preference for Grades of Eggs

*The sample of consumers in Baton Rouge placed the U.S.D.A. grades of eggs in the order A, B, AA, and C (Table 3).* All differences among the grades were "significant" at the 95 per cent level. All of the significance tests were done by chi-square analysis.<sup>2</sup> Some of the results in this publication are presented in percentages for ease of comparison, but actual numbers were used in the "significant" tests.

Grade AA eggs are rarely offered for sale in the Baton Rouge area. In the test, *Grade AA received more votes for last place than for first.* Since most of the respondents had seen Grade AA rarely or never, the AA egg may have represented something different. It was noted that many of the respondents downrated Grade AA because, in their opinion, the yolk looked too small. However, the same amount of yolk and albumen was present in all of the eggs.

Grade A received more first and second place votes than any other grade. If a plurality of consumers had placed Grade AA in first place, then the consumer preferences in this study would have been represented by a diagonal line with Grade AA in first place, Grade A in second place, Grade B in third place, and Grade C in fourth place (underlined numbers in Table 3). Grade C was placed fourth more than any other grade in any other position. A significant correlation of consumer preference with U.S.D.A. Grades A, B, and C was evident.

### Preference for Grades Related to Socio-Economic Characteristics

*Preference for grades of eggs was significantly related to race.* People of the white race chose higher grades (AA, A) than did Negroes (Table 4).

<sup>2</sup>Chi-square analysis, Appendix Table 1. "Significance" means the order of placings could have occurred by chance in only 1 of 20 times. Chi-square analysis and tests of significance are analytical procedures used by researchers to test the validity of their observations.

**TABLE 4.—Race and Sex As Related to Preference for Grades of Eggs, Baton Rouge, August, 1961<sup>1</sup>**

| Choice | Grade | Race     |          | Sex      |          |
|--------|-------|----------|----------|----------|----------|
|        |       | White    | Negro    | Male     | Female   |
|        |       | Per cent | Per cent | Per cent | Per cent |
| First  | AA    | 27.0     | 23.9     | 20.2     | 27.8     |
|        | A     | 36.3     | 26.1     | 21.5     | 36.9     |
|        | B     | 28.9     | 38.6     | 40.5     | 28.8     |
|        | C     | 7.8      | 11.4     | 17.8     | 6.5      |
| Second | AA    | 19.2     | 13.5     | 10.1     | 19.5     |
|        | A     | 48.3     | 40.9     | 49.4     | 46.6     |
|        | B     | 23.9     | 28.4     | 26.6     | 24.4     |
|        | C     | 8.5      | 17.2     | 13.9     | 9.5      |
| Third  | AA    | 24.0     | 32.8     | 25.3     | 24.6     |
|        | A     | 14.8     | 23.1     | 26.6     | 15.6     |
|        | B     | 44.9     | 29.5     | 31.6     | 44.3     |
|        | C     | 16.3     | 14.6     | 16.5     | 15.5     |
| Fourth | AA    | 28.9     | 31.8     | 44.3     | 26.7     |
|        | A     | 2.4      | 8.0      | 2.5      | 3.5      |
|        | B     | 2.1      | 3.4      | 1.3      | 3.5      |
|        | C     | 66.6     | 56.8     | 51.9     | 67.3     |

<sup>1</sup>Underscores indicate expected choice by consumers.

**TABLE 5.—Age and Preference for Grades of Eggs, Baton Rouge, August, 1961<sup>1</sup>**

| Choice | Grade | Age group (years) |           |           |            |
|--------|-------|-------------------|-----------|-----------|------------|
|        |       | Under 25          | 25 - 34   | 35 - 49   | 50 or more |
|        |       | — — — — —         | — — — — — | — — — — — | — — — — —  |
| First  | AA    | 7.6               | 26.0      | 28.7      | 30.4       |
|        | A     | 32.7              | 33.4      | 33.2      | 37.0       |
|        | B     | 46.2              | 30.2      | 30.4      | 26.5       |
|        | C     | 13.5              | 10.4      | 7.7       | 6.1        |
| Second | AA    | 11.5              | 12.0      | 17.7      | 23.8       |
|        | A     | 32.7              | 47.9      | 48.6      | 49.2       |
|        | B     | 32.7              | 30.2      | 22.7      | 21.5       |
|        | C     | 23.1              | 9.9       | 11.0      | 5.5        |
| Third  | AA    | 30.7              | 32.4      | 25.4      | 21.0       |
|        | A     | 32.7              | 14.5      | 16.0      | 13.2       |
|        | B     | 19.2              | 38.5      | 43.1      | 49.2       |
|        | C     | 17.4              | 14.6      | 15.5      | 16.6       |
| Fourth | AA    | 50.1              | 29.2      | 29.2      | 24.9       |
|        | A     | 1.9               | 6.2       | 1.7       | 1.9        |
|        | B     | 1.9               | 0.0       | 3.9       | 3.0        |
|        | C     | 46.1              | 64.6      | 65.2      | 70.2       |

<sup>1</sup>Underscores indicate expected choice by consumers.

Female shoppers had significantly higher preferences for the better grades of eggs when compared with the male shoppers. Almost 65 per cent of the women placed AA or A in first place, compared with about 42 per cent for the men (Table 4).<sup>3</sup>

Although there were direct "patterns" of grade preference related to profession, none of the differences in placings among the occupations were "statistically significant."

When grade preference was related to age, only the preferences of the under-25-years-of-age group were significantly different from the 50-years-or-more group and the 35-49-years group (Table 5).

There was a direct pattern between age and grade knowledge, but this variation was not significant. *There was no significant difference in egg preferences in relation to income, education, or background (rural versus urban).*

## Consumer Preference for Interior Egg Grades and Sizes in New Orleans

### Methodology

The interviews were conducted on Thursdays, Fridays, and Saturdays in each of three large supermarkets of the same grocery store chain. The grocery supermarkets were selected in different areas to reflect different socio-economic levels.

In this study egg size as well as grade preference was tested. *Real fried eggs were used because plastic egg models were not available in different sizes.* Care was taken to control (within limitations previously cited) such variables as grade, cooking method, and demonstration. Two tests were used. In the "ranking" test, nine different grade-size combinations (Grades A, B, C and sizes Extra Large, Large, and Medium) were viewed *at the same time* and ranked by consumers as to preference (Figure 2). This test was used to give one-to-nine "ranked" choices and to determine whether size or grade was more important in egg preference.

The other test used was a "matched lot-limited view" test.<sup>4</sup> This test was used to help determine the effect on consumer preferences when holding either size or quality (grade) constant while the other varied. The eggs were grouped as illustrated in Figure 3. Eggs in each of three cells (groups) varied only in size and eggs in three cells varied only in grade.

The allocation of cells was randomized. The respondent's starting point and the position of the eggs within cells were also changed fre-

<sup>3</sup>Chi-square analysis. See Appendix Table 2.

<sup>4</sup>"Matched lot" means that the three eggs in each group were placed side-by-side so respondents could "match" the appearance of the eggs and then choose one egg.





FIGURE 2.—Ranking Test. Consumer's preference being recorded.

quently to reduce positional bias. The ranking test and matched lot test were alternated on a morning and afternoon basis. Thus, a different group of respondents was involved in each test. Approximately equal time was given to both tests.

The eggs were fried in vegetable oil at a low temperature so the albumen would not "bubble." They were displayed "sunny-side-up" in

|                                                                        |                                                                        |                                                                           |
|------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <p>(Cell 1)<br/>Large Eggs<br/>Grade B<br/>Grade A      Grade C</p>    | <p>(Cell 2)<br/>Grade A Eggs<br/>Extra Large<br/>Medium      Large</p> | <p>(Cell 3)<br/>Extra Large Eggs<br/>Grade A<br/>Grade C      Grade B</p> |
| <p>(Cell 4)<br/>Grade B Eggs<br/>Large      Extra Large<br/>Medium</p> | <p>(Cell 5)<br/>Medium Eggs<br/>Grade C      Grade A<br/>Grade B</p>   | <p>(Cell 6)<br/>Grade C Eggs<br/>Extra Large      Medium<br/>Large</p>    |

FIGURE 3.—Diagram of display used in matched lot test.

aqua-colored plates lettered according to a randomized selection from the middle of the alphabet.<sup>5</sup>

The purpose of the interview was explained to the consumer as "a marketing survey to find out which eggs people like." The matched lot test was easier for the respondent than the ranking test because she chose from only three eggs each time rather than from nine. However, in the ranking test, all respondents were asked to choose the top three eggs and then the next three. Therefore, the three remaining eggs were grouped automatically as the least preferred group (Figure 2). The consumer then chose a first and second preference within each group. The remaining egg in each group was considered as the least preferred.

<sup>5</sup>The lettering was *only* for identification for use by the researcher. Letters from midalphabet were used so the respondent *would not* attach any significance to the lettering (such as might be true with A, B, C, etc.) to avoid biasing replies.

**TABLE 6.—Characteristics of the Consumer Sample, Egg Preference Test, New Orleans, Louisiana, June, 1961**

| Characteristics of respondents | Number | Per cent | Characteristics of respondents | Number | Per cent |
|--------------------------------|--------|----------|--------------------------------|--------|----------|
| Occupation:                    |        |          | Education:                     |        |          |
| Professional and white collar  | 224    | 49.7     | 0 - 4 years                    | 9      | 2.0      |
| Skilled                        | 83     | 18.4     | 5 - 8 years                    | 55     | 12.2     |
| Unskilled                      | 84     | 18.6     | 9 - 12 years                   | 195    | 43.2     |
| Retired or unemployed          | 60     | 13.3     | Business or vocational school  | 31     | 6.9      |
|                                |        | 100.0    | Some college                   | 78     | 17.3     |
|                                |        |          | College degree                 | 78     | 17.3     |
|                                |        |          | Unclassified                   | 5      | 1.1      |
| Age:                           |        |          |                                |        | 100.0    |
| Under 25 years                 | 40     | 8.9      | Working members of family:     |        |          |
| 25 - 34 years                  | 84     | 18.6     | None                           | 40     | 8.8      |
| 35 - 49 years                  | 250    | 55.4     | One                            | 297    | 65.9     |
| 50 years or more               | 58     | 12.9     | Two                            | 96     | 21.3     |
| Unclassified                   | 19     | 4.2      | Three                          | 12     | 2.7      |
|                                |        | 100.0    | Four                           | 6      | 1.3      |
| Race:                          |        |          |                                |        | 100.0    |
| Negro                          | 142    | 31.5     | Family income (dollars):       |        |          |
| White                          | 309    | 68.5     | Below 2,000                    | 19     | 4.2      |
|                                |        | 100.0    | 2,000 - 3,999                  | 48     | 10.6     |
| Sex:                           |        |          | 4,000 - 5,999                  | 100    | 22.3     |
| Male                           | 99     | 21.9     | 6,000 - 7,999                  | 75     | 16.6     |
| Female                         | 352    | 78.1     | 8,000 - 9,999                  | 52     | 11.5     |
|                                |        | 100.0    | 10,000 or more                 | 86     | 19.1     |
| Background:                    |        |          | Unclassified                   | 40     | 8.8      |
| Rural farm                     | 91     | 20.2     | Unemployed                     | 31     | 6.9      |
| Rural nonfarm                  | 34     | 7.5      |                                |        | 100.0    |
| Urban                          | 326    | 72.3     |                                |        |          |
|                                |        | 100.0    |                                |        |          |

# Results of the New Orleans Study

## Characteristics of Respondents

The predominant groups of people in the sample were professional and white collar workers, 35-49 years of age, white, female, and of urban background (Table 6). At least 35 per cent of the respondents had some college education. Thirty-seven per cent of the respondents had an annual family income of under \$6,000. Sixteen per cent were unemployed or unclassified, with respect to income.

## Preferences for Grades and Sizes of Eggs: Two Tests

**Ranking Test**—There were 241 people who participated in the ranking test. Of the first choice decisions, Grade A eggs were selected 87 per cent of the time, Grade B, 10 per cent, and Grade C only 2 per cent (Table 7). *A statistically significant choice pattern for grades was evident.*<sup>6</sup> Grade A was the predominant first, second, and third place

<sup>6</sup>See footnote 2, Page 8.

**TABLE 7.—Consumer Preferences for Sizes and Grades of Eggs, Ranking Test, New Orleans, June, 1961<sup>1</sup>**

| Choice   |      | Sizes and grades |           |           |           |           |           |           |           |           |
|----------|------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|          |      | Extra Large      |           |           | Large     |           |           | Medium    |           |           |
|          |      | A                | B         | C         | A         | B         | C         | A         | B         | C         |
| First:   | No.  | 70               | 6         | 3         | 90        | 14        | 3         | 50        | 4         | 1         |
|          | Pct. | <u>29</u>        | 2         | 1         | <u>37</u> | 6         | 1         | <u>21</u> | 2         | 0         |
| Second:  | No.  | 66               | 11        | 1         | 81        | 9         | 8         | 56        | 7         | 2         |
|          | Pct. | <u>27</u>        | 5         | 0         | <u>34</u> | 4         | 3         | <u>23</u> | 3         | 1         |
| Third:   | No.  | 68               | 16        | 8         | 38        | 12        | 6         | 81        | 11        | 1         |
|          | Pct. | <u>28</u>        | 7         | 3         | <u>15</u> | 5         | 2         | <u>34</u> | 5         | 0         |
| Fourth:  | No.  | 20               | 58        | 7         | 13        | 59        | 11        | 20        | 46        | 8         |
|          | Pct. | 8                | <u>24</u> | 3         | 5         | <u>25</u> | 5         | 8         | <u>19</u> | 3         |
| Fifth:   | No.  | 8                | 49        | 18        | 8         | 59        | 13        | 11        | 53        | 22        |
|          | Pct. | 3                | <u>20</u> | 8         | 3         | <u>25</u> | 5         | 5         | <u>22</u> | 9         |
| Sixth:   | No.  | 3                | 44        | 33        | 7         | 43        | 27        | 8         | 51        | 25        |
|          | Pct. | 1                | <u>18</u> | 14        | 3         | <u>18</u> | 11        | 3         | <u>21</u> | 10        |
| Seventh: | No.  | 5                | 32        | 59        | 2         | 24        | 43        | 6         | 35        | 35        |
|          | Pct. | 2                | 13        | <u>25</u> | 1         | 10        | <u>18</u> | 2         | 15        | <u>15</u> |
| Eighth:  | No.  | 0                | 16        | 61        | 2         | 19        | 71        | 33        | 20        | 49        |
|          | Pct. | 0                | 7         | <u>25</u> | 1         | 8         | <u>30</u> | 1         | 8         | <u>20</u> |
| Ninth:   | No.  | 2                | 9         | 50        | 1         | 2         | 65        | 7         | 7         | 98        |
|          | Pct. | 1                | 4         | <u>20</u> | 0         | 1         | <u>27</u> | 3         | 3         | <u>41</u> |

<sup>1</sup>Underscores indicate highest grade choice under each size category.

choices. Grade B was preferred in fourth, fifth, and sixth place choices. Grade C dominated the seventh, eighth, and ninth place choices. *A significant choice pattern for size preference was observed in the first three choices and in the ninth choice. Consumers selected eggs in the order of Large, Extra Large, and Medium sizes.* If consumers had chosen on a grade basis only, as related to area covered by albumen, the size selection would have been Medium, Large, and Extra Large. If they had chosen on size alone, they would have ranked the eggs as Extra Large, Large, and Medium. A selection compromise was thus shown between size and grade preferences. *Grade of egg was a stronger basis for selection than size of egg.*

Weighted placings shown in Tables 8 and 9 were determined as follows: Nine points were assigned for a first choice selection. Each subsequent placing was assigned a corresponding graduated weight down to one point for a ninth choice. Weighted placings were used to compare the relative total placing of each egg. If weighted placings had not been used, each total would have been the same, since the same number of

**TABLE 8.—Consumer Preferences for Sizes and Grades of Eggs, Ranking Test, Weighted Placings, New Orleans, June, 1961<sup>1</sup>**

| Choice  | Sizes and grades |     |     |       |     |     |        |     |     |
|---------|------------------|-----|-----|-------|-----|-----|--------|-----|-----|
|         | Extra Large      |     |     | Large |     |     | Medium |     |     |
|         | A                | B   | C   | A     | B   | C   | A      | B   | C   |
|         | —                | —   | —   | —     | —   | —   | —      | —   | —   |
|         | Weighted Points  |     |     |       |     |     |        |     |     |
| First   | 630              | 54  | 27  | 720   | 126 | 27  | 450    | 36  | 9   |
| Second  | 528              | 88  | 8   | 648   | 72  | 64  | 448    | 56  | 16  |
| Third   | 476              | 112 | 56  | 259   | 84  | 42  | 567    | 77  | 7   |
| Fourth  | 120              | 348 | 42  | 78    | 354 | 66  | 120    | 276 | 42  |
| Fifth   | 40               | 245 | 90  | 40    | 295 | 65  | 55     | 265 | 110 |
| Sixth   | 12               | 176 | 132 | 28    | 172 | 108 | 32     | 204 | 100 |
| Seventh | 12               | 96  | 177 | 6     | 72  | 129 | 18     | 105 | 105 |
| Eighth  | 0                | 32  | 122 | 4     | 36  | 142 | 6      | 40  | 98  |
| Ninth   | 2                | 9   | 49  | 1     | 2   | 65  | 7      | 7   | 98  |

<sup>1</sup>Weighted in reverse order to choice: 1st = 9 points, 2nd = 8 points, etc.

**TABLE 9.—Summary, Consumer Preferences for Sizes and Grades of Eggs, Ranking Test, Total Weighted Placings, New Orleans, June, 1961<sup>1</sup>**

| Size        | Grade           |       |       | Size total |
|-------------|-----------------|-------|-------|------------|
|             | A               | B     | C     |            |
|             | —               | —     | —     | —          |
|             | Weighted Points |       |       | —          |
| Extra Large | 1,820           | 1,160 | 703   | 3,683      |
| Large       | 1,784           | 1,213 | 708   | 3,705      |
| Medium      | 1,703           | 1,066 | 585   | 3,354      |
| Grade total | 5,307           | 3,439 | 1,996 | 10,742     |

<sup>1</sup>Weighted in reverse order of choice: 1st = 9 points, 2nd = 8 points, etc.



people chose eggs. For example, Extra Large Grade A was chosen in first place by 70 people (Table 7). Then  $70 \times 9$  points for first = 630. There were significant total preference differences among the three sizes and among the three grades. *Selection patterns for weighted preference also indicated that grade was more important than size (See Table 9). Of first choice preferences, consumers ranked the eggs as follows: Large A, Extra Large A, Medium A, Large B, Extra Large B, Medium B, Large C, Extra Large C, and Medium C.* This was the same preference ranking as when all choices were grouped (Table 9).

Table 9 contains the totals from Table 8. For example, the total of 1,820 is the sum of the weighted points of 630, 528, 476, 120, 40, 12, 12, 0, and 2 from Table 8, first column. Each total in Table 8 was obtained in the same manner. Therefore, each total was used (1,820 is part of 3,683 for size and also part of 5,307 for grade) to get the relative importance of sizes and grades. Thus, the totals of 5,307 (Grade A), 3,439 (Grade B), and 1,996 (Grade C) can be compared for relative importance by the size of the numbers—A was first, B was second, C was third. The size totals 3,683 (Extra Large), 3,705 (Large), and 3,354 (Medium) can be compared likewise. In summary, preference significance was shown for grades but not for sizes, in all choices.

**Matched Lot-Limited View Test**—There were 210 people who participated in the matched lot-limited view test. This test must be considered as six individual choices since only three eggs were observed each time a choice was made (Figure 3). When Grade A was held constant, there was no significant difference in preference selection among the three sizes (Table 10). The significant size order for Grade B was Large, Extra Large, and Medium; for Grade C it was Large, Medium, and Extra Large. When size was held constant in cells 4, 5, and 6, significant grade

**TABLE 10.—Consumer Preferences for Sizes and Grades of Eggs, Limited View Test, New Orleans, June, 1961**

| Location                       | Size or grade | First choices of sizes and grades |     |       |     |        |     |
|--------------------------------|---------------|-----------------------------------|-----|-------|-----|--------|-----|
|                                |               | Extra Large                       |     | Large |     | Medium |     |
|                                |               | (Grade constant - Size varies)    |     |       |     |        |     |
| Cell                           | Grade         | Pct.                              | No. | Pct.  | No. | Pct.   | No. |
| 1                              | A             | 39                                | 82  | 32    | 67  | 29     | 61  |
| 2                              | B             | 37                                | 78  | 47    | 99  | 16     | 34  |
| 3                              | C             | 26                                | 55  | 40    | 84  | 34     | 71  |
| (Size constant - Grade varies) |               |                                   |     |       |     |        |     |
| Cell                           | Size          | Pct.                              | No. | Pct.  | No. | Pct.   | No. |
| 4                              | Extra Large   | 79                                | 166 | 13    | 27  | 8      | 17  |
| 5                              | Large         | 81                                | 170 | 15    | 32  | 4      | 8   |
| 6                              | Medium        | 85                                | 178 | 10    | 21  | 5      | 10  |

preference differences were evident with Grade A first, B second, and C third (compare relative size of figures in columns 2 and 6). Essentially this test showed grade was a more important variable than size in consumer preference, *just as shown in the "ranking" test.*

### **Preferences Related to Socio-Economic Characteristics**

Almost identical results were obtained by the ranking test and the matched lot test when related to socio-economic characteristics. That is, *none of the population characteristics were statistically different when related to grade and size preferences.* These characteristics included race, sex, occupation, age, background, education, income, and size of family.

## **Evaluation of Experimental Methods of Consumer Testing**

Various approaches and techniques have been used by researchers in consumer preference testing. In addition to determining consumer preferences for egg characteristics, this study was also intended to evaluate two techniques of consumer preference research. These techniques were the "matched lot-limited view" and the "ranking" tests. This evaluation also includes advantages and disadvantages of methods which were considered for the study.

### **Location and Sample**

One of the best places to do a consumer study is in the supermarket. If the mechanics of the test are complex, then the home may be better. Because of many socio-economic variables in the population, an appropriate sample size is difficult to determine. The sample should be selected for the variables which are believed to affect preference, such as race, income, education, sex, etc. Samples should be taken from supermarkets which reflect different levels of these socio-economic factors.

### **Matched Lot versus Ranking Test**

The decision as to which test to use is determined by the objectives of the study. The ranking test will give an over-all order of consumer choices; however, after a consumer's first and second choice, other choices have little practical importance. Many times a consumer is faced with the combination of only two sizes and two grades. The ranking test was found to be the better test for studying size and grade at the same time.

### **Egg Models versus Real Eggs**

Both egg models and real eggs have their limitations in consumer research. The models have the slight limitation of not looking exactly

like real eggs. All models had the "usual" yolk index of each grade. Real eggs of the same grade may have several different yolk indexes. Grade B eggs may sometimes have a Grade A yolk. Grade regulations do not consider yolk index. When models are used, the "yolk variation" is removed. Since grade is generally synonymous with albumen height, testing with models may be sufficient because egg models vary only in albumen height and have an "average" yolk index. There are several variables inherent in a normal sample of one grade of eggs. Variations will exist in yolk index, color of yolk, mottling, and chalazae. If all of these variables were measured at one time a consumer test would be overburdened with test variables.

### **Cooked versus Uncooked Eggs**

When real eggs are used, should they be cooked or uncooked? Cooked eggs were used in New Orleans so the respondents could clearly see all of the albumen, but it was decided that the technique of cooking affected the appearance too much. The low grade eggs tend to "bubble" and the general appearance is affected more by cooking.

### **Method of Cooking**

In a market survey it was found that the methods of cooking eggs were: 53 per cent fried, 29 per cent scrambled, 20 per cent boiled, and 14 per cent poached.<sup>7</sup> If fried eggs are used, the method of presentation places a bias on some consumer choices since they use other methods of cooking.

### **Use of Photographs of Eggs**

Some researchers have used colored photographs. If grade preference is being tested, photographs have severe limitations since the effect of a third dimension is lost. Photographs can be used for testing yolk color preference.

### **Comparison With Other Egg Preference Studies**

Egg preference studies in states other than Louisiana indicated that consumers preferred egg grades in the order of AA, A, B, and C. The Baton Rouge study showed that consumers preferred the AA grade in third place. Consumers in New Orleans ranked the grades in the "proper" order but Grade AA was not included in the study.

Apparently, consumers in other test markets have a better preference for the higher grades of eggs. The New Orleans study was the only reported study that has tested the preference for size of egg. Also, it has been the only one that has used chi-square in analyzing the results.

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<sup>7</sup>*Homemaker's Use of and Opinions About Eggs*, Marketing Research Report No. 405, USDA, AMS, Market Development Research Division.

## **Summary**

Tests of consumers' preferences for interior grades and sizes of eggs were conducted in Baton Rouge and New Orleans, Louisiana, in 1961. The studies were done in six modern supermarkets located in different socio-economic areas. Significant results disclosed by the studies were as follows:

### **Baton Rouge**

1. Egg grades were preferred in the order of A, B, AA, and C in the sample stores. (Plastic egg models were used.)
2. Higher grades were preferred by Caucasians and female shoppers. No significant difference in grade preference was shown among occupations, ages, backgrounds, or formal education of consumers.

### **New Orleans**

1. Egg grades were ranked A, B, and C (AA was not included in this part of the study). (Real eggs were used.)
2. Egg sizes were preferred in the order of large, extra large, and medium.
3. Egg grade was more important than egg size in consumer preferences.
4. The various socio-economic characteristics (age, occupation, background, formal education, etc.) did not affect preferences for grades in the New Orleans sample stores. The results were not statistically different between these categories of characteristics.



# Appendix

APPENDIX TABLE 1.—Chi-Square Test: Test for Significant Differences in Preferences for Grades of Eggs

| Grade | Consumer placing |        |       |        | Total |
|-------|------------------|--------|-------|--------|-------|
|       | First            | Second | Third | Fourth |       |
| AA    | 136              | 92     | 126   | 150    | 504   |
| A     | 176              | 240    | 81    | 11     | 508   |
| B     | 156              | 126    | 214   | 12     | 508   |
| C     | 42               | 50     | 80    | 331    | 503   |

Chi-Square Test, Grade AA:

| Observed | Expected* | Deviations | (Deviations) <sup>2</sup> | (Deviations) <sup>2</sup> |
|----------|-----------|------------|---------------------------|---------------------------|
|          |           |            |                           | Expected                  |
| 136      | 126       | 10         | 100                       | 0.79365                   |
| 92       | 126       | 34         | 1,156                     | 9.17460                   |
| 126      | 126       | 0          | 0                         | 0                         |
| 150      | 126       | 24         | 576                       | 4.57143                   |
| Total    |           |            |                           | 14.53968                  |

\*504

$$\frac{504}{4} = 126$$

Degrees of freedom 3,  $X^2 = 7.81$  Significant Difference  
.05



# Rural Education in Transition

## A STUDY OF TRENDS AND PATTERNS IN LOUISIANA

by  
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and  
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## Summary and Conclusions

This investigation was undertaken to determine trends and patterns in rural education in Louisiana. Information for the study was obtained from pertinent federal censuses, from various Louisiana State Department of Education publications, and from questionnaire responses of high school juniors and seniors in selected sample schools. The study proceeded on the assumption that it was necessary to catalog recent demographic and other socio-cultural changes in order to plan wisely for the future of rural schools. Findings are summarized below.

### Summary

Population trends are basic to studies of rural education, so the first concern of the study was to determine what changes in the number, composition and distribution of the state's population had taken place in the last quarter century. Especial emphasis was given the rural population because of the focus of the study. It was found that the state's urban population is growing at a rapid rate while its rural population is decreasing. Negroes have decreased in numbers faster than whites in rural areas within recent years.

The school-age population (7-17 years) in the state increased by almost one-half in 30 years, but virtually all this increase took place in urban areas. Rural parishes had approximately the same number of children in these ages in 1930 as in 1960.

School enrollment has increased in rural areas even though population has not. A much larger percentage of children 7-17 years of age attended school in 1960 than did in 1930. This is true of both whites and nonwhites. Urban areas also experienced an increase in enrollment.

Not only has the number of teachers in the state increased but the educational qualifications and experience of teachers have improved. Interestingly, teachers in rural areas now are generally as well qualified and experienced as teachers in urban areas. This was not true in past years.

Public schools in Louisiana are not small by comparison with urban schools in the state and national averages. The effect of consolidation is seen in the greatly decreased number of rural schools. These schools continue to lag behind urban schools in size, however.

The curriculum outlined for rural high schools in Louisiana is in keeping with high standards of education. However, no especial program is available for students in the smaller rural schools and these students

are handicapped because of limited curricula offerings in vocational and other subjects not prescribed as mandatory.

Several characteristics of rural schools were brought out in the case study of 10 schools in 2 parishes as follows: (1) Of the pupils attending rural schools, all lived in the country or in a small hamlet, but only approximately 1 out of 3 came from a farm. Of the students attending high schools in towns, only about half lived in the towns proper, while around one-third were from farms and the remainder lived in the open country but not on a farm. (2) The data collected showed that from two-thirds to four-fifths of the students attending the rural schools rode school buses, while around half of the students attending the town schools were transported to schools via public conveyances. (3) The distance students in rural schools had to travel to school varied with settlement patterns, but the majority of students lived at least 3 miles away. The majority of students attending the town schools lived less than 4 miles from their school. (4) The responses of male students in the rural schools indicated that only 1 in 20 expected to be farmers. Even fewer of the boys in the town schools aspired to this occupation. (5) Two out of 3 of the students in the rural schools expected to continue their education beyond high school. Only a slightly higher percentage of town students expressed this intention. A relatively large number of girls in rural high schools (33 per cent) planned to go to some sort of vocational school after graduation. Only 5 per cent of the boys in these schools planned such a program. (6) The evidence gathered suggests that neither the rural nor the town schools serve as strong focal points for community activities. Athletic events apparently are the strongest drawing cards for people in communities surrounding the school.

## Conclusions and Implications

Findings of the study have relevance in terms of public school planning for the future. It is clear that the number of people in the state is increasing but that the rural segment of the population is not sharing in this growth. This phenomenon is not unique to Louisiana and is accounted for by technological innovations which have reduced labor needs in agriculture and related rural occupations. The implications for rural education of a static population are not too clear, but certain observations can be made.

In the first place, additional teachers and additional classrooms will not be serious problems in the foreseeable future, as will be the case in urban areas. Nor will there be an alarming deficit in the quality of instruction if one is to judge according to the trends which indicate that the training and experience of rural teachers have improved through the years and is now comparable to that of urban teachers.

Secondly, trends in enrollment indicate that school attendance is no longer the problem (legal or otherwise) in rural Louisiana that it was a few years ago. Apparently, efforts to get children in school have been successful in even the most isolated places.

In the third place, it is apparent that rural schools serve a great majority of students who will not find their life's work in agriculture, and who will not live out their lives in rural areas. The significance of this fact for high school curriculum and for the general philosophy of education in rural areas is self-evident. It represents an important and immediate challenge to curriculum planners.

Finally, there is an over-all implication that stems from the fact that both the population and the socio-cultural patterns are changing rapidly in the state. As levels of living, educational levels, communication and transportation improve, it is inevitable that attitudes and values toward education will change. Persons who share a concern over rural education must familiarize themselves with these trends if they are to plan wisely for the future.

# Rural Education in Transition

## A Study of Trends and Patterns in Louisiana

MARION B. SMITH AND ALVIN L. BERTRAND\*

### Introduction

Citizens of Louisiana have long had to face the fact that the educational status of the state's population was among the lowest in the nation. All studies of education in the state point up the fact that certain segments of the population do not have the educational advantages of other population groups. Two such disparities have stood out over the years—the difference between the rural and urban segments of the population and the difference between Negroes and whites.

This study was undertaken to bring up to date the information on the trends and patterns which relate to rural education. A study of rural education is important for several reasons, including the increasing urbanization of the state. Such information is, of course, basic to the planning for progress which is being done in the state and nation. It also serves a fundamental purpose of measuring the success of past programs of rural population at a point in time.

### Timeliness of Study

Several developments convinced the writers that a study of rural education would be most timely. First, the detailed results of the Eighteenth Decennial Census have only recently become available. According to these data the rural people continue to lag significantly behind the urban people of the state in education, although both groups showed considerable improvement during the past decade. In 1960, the median number of years of schooling completed by adults (those persons 25 years and over) was 9.8 years for urban persons but only 7.5 years for rural persons.<sup>1</sup> This differential is such as to warrant close scrutiny.

The second development was a research grant from the Farm Population Branch of the U. S. Department of Agriculture to the Department of Rural Sociology at Louisiana State University to study dropouts in rural high schools. This grant made it possible to interview students

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<sup>1</sup>Unless otherwise specified, data quoted throughout this report for 1960 will be from the *United States Census of Population, 1960*, PC (1) A-D, U. S. Department of Commerce, Bureau of the Census, Washington, D.C. Data from other censuses will be used occasionally with appropriate reference.



and teachers in selected rural high schools and thus to obtain first-hand information about rural education in the state. A previous publication from this study dealt primarily with the dropout problem.<sup>2</sup>

Finally, a comprehensive study of rural education in the state approximately one-quarter of a century ago provided a basis for measuring trends.<sup>3</sup>

## Methods and Procedures

The data for this study came from several sources. Publications of the Bureau of the Census and of the Louisiana State Department of Education were used extensively. In each instance where data from these sources were utilized, an appropriate reference is made although specific citations are omitted.

Since the aim of the study was to highlight changes in rural education the data for parishes were grouped in such a way as to more clearly show trends and patterns in the rural segment of the population. In 1950, for the first time in the history of the state, the majority of Louisianians were found to be living in urban places. The writers felt this was a key year from which to measure changes. The 6 most urban parishes in 1950 (65 per cent urban or more) and the 29 most rural parishes in 1950 (75 per cent rural or more) were selected to serve as bases for comparisons. Trends in these parishes are shown in the tables which are included.

The final section of this report is an analysis of certain data obtained from the field survey made in connection with the cooperative study mentioned above. This study was done during the school year 1958-59 and included 10 schools in two parishes, one in French South Louisiana, and one in non-French (Anglo-Saxon, Scotch-Irish) North Louisiana. The high school juniors and seniors (grades 11 and 12) and the teachers and principals in the 10 sample schools were interviewed and asked to answer a list of questions. Altogether, 389 junior and senior students completed the questionnaires.<sup>4</sup>

## Population Trends in Louisiana: 1930 - 1960

The intent of this study was to examine changes in rural education in Louisiana over the last quarter century. However, since national censuses are taken at 10-year intervals, it is necessary to show some trends over a 30-year span going back to 1930.

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<sup>2</sup>Alvin L. Bertrand and Marion B. Smith, *Environmental Factors and School Attendance: A Study in Rural Louisiana*, La. Agricultural Experiment Station Bulletin No. 533, May, 1960.

<sup>3</sup>Marion B. Smith, *A Sociological Analysis of Rural Education in Louisiana*, (Baton Rouge: Louisiana State University Press, 1938).

<sup>4</sup>The details of the study appear in Bertrand and Smith, *op. cit.*

TABLE 1.—Population Trends in Louisiana, 1930-1960, by Race, Residence and Most Urban and Most Rural Parishes

| Population Group               | 1930      | 1940      | 1950      | 1960      | Increase or Decrease 1930-1960 |          |
|--------------------------------|-----------|-----------|-----------|-----------|--------------------------------|----------|
|                                |           |           |           |           | Number                         | Per Cent |
| <b>Total Population</b>        | 2,101,593 | 2,363,880 | 2,683,516 | 3,257,022 | 1,155,429                      | 55.0     |
| <b>Residence</b>               |           |           |           |           |                                |          |
| Urban                          | 833,532   | 980,439   | 1,471,696 | 2,060,606 | 1,227,074                      | 147.2    |
| Rural-Farm                     | 826,822   | 850,382   | 567,455   | 233,138   | -593,744                       | -71.8    |
| Rural-nonfarm                  | 441,179   | 533,059   | 644,365   | 963,278   | 522,099                        | 118.3    |
| <b>Race</b>                    |           |           |           |           |                                |          |
| Whites                         | 1,318,160 | 1,511,739 | 1,796,683 | 2,211,954 | 893,794                        | 67.8     |
| Urban                          | 574,249   | 665,464   | 1,022,931 | 1,415,619 | 841,370                        | 146.5    |
| Rural-Farm                     | 451,063   | 469,446   | 332,608   | 141,739   | -309,324                       | -68.6    |
| Rural-Nonfarm                  | 292,848   | 376,829   | 441,144   | 654,516   | 361,668                        | 123.5    |
| Nonwhites                      | 783,433   | 852,141   | 886,833   | 1,045,068 | 261,635                        | 33.4     |
| Urban                          | 259,283   | 314,975   | 448,765   | 644,907   | 385,624                        | 148.7    |
| Rural-Farm                     | 375,819   | 380,936   | 234,847   | 91,399    | -284,420                       | -75.6    |
| Rural-Nonfarm                  | 148,331   | 156,230   | 203,221   | 308,762   | 160,431                        | 108.2    |
| <b>6 Most Urban Parishes*</b>  |           |           |           |           |                                |          |
| Urban                          | 787,972   | 899,256   | 1,173,449 | 1,537,349 | 749,377                        | 95.1     |
| Rural-Farm                     | 631,691   | 708,126   | 1,045,421 | 1,388,671 | 756,980                        | 119.8    |
| Rural-Nonfarm                  | 67,628    | 62,170    | 35,186    | 10,595    | -57,033                        | -85.1    |
|                                | 88,653    | 128,960   | 92,842    | 138,038   | 49,385                         | 55.7     |
| <b>29 Most Rural Parishes*</b> |           |           |           |           |                                |          |
| Urban                          | 523,115   | 573,131   | 536,066   | 569,113   | 45,998                         | 8.8      |
| Rural-Farm                     | 16,040    | 32,102    | 53,906    | 122,756   | 106,716                        | 665.3    |
| Rural-Nonfarm                  | 342,038   | 362,466   | 240,586   | 98,583    | -243,455                       | -71.2    |
|                                | 165,037   | 178,563   | 241,574   | 347,774   | 182,737                        | 110.7    |

\*Based on 17th Decennial Census

The total population of Louisiana in 1930 was 2,101,593. By 1940, the number of people in the state had increased to 2,363,880, an increase of 262,287 or 12.5 per cent. In 1950, the population had reached 2,683,516, an increase of 319,636 or 13.5 per cent over 1940. The 1960 Louisiana population included a total of 3,257,022 persons. This number represented an increase of 1,155,429 individuals or 55.0 per cent in 30 years.

## Rural Population Trends and Their Significance for Education

The population of the state in 1930 was less than 40 per cent urban, (39.7). Approximately the same number of people (39.3 per cent) was classed as rural-farm and 21.0 per cent was classified rural-nonfarm. By 1950 the rural-farm population had decreased from 1930 by 259,427 persons (31.4 per cent); the rural-nonfarm had increased by 203,186 persons. This amounted to a 46.1 per cent gain in rural-nonfarm population in 20 years. The urban population of the state rose by 638,164 individuals for an increase of 76.6 per cent. By 1960 the rural-farm population had decreased to 233,138 persons, a loss in population during the previous 30 years of 593,744 or 71.8 per cent. The rural-nonfarm population increased during this time to 522,099, a gain of 118.3 per cent, and the urban population rose to 2,060,606, an increase of 1,227,074 or 147.2 per cent.

The six most urban parishes in 1950 (those with a population 65 per cent or more urban) were Orleans, Caddo, East Baton Rouge, Jefferson, Calcasieu, and Ouachita. In 1930, the total population of these parishes was 787,972, which was 37.5 per cent of the total population of the state. The 1960 census showed the total population of these six parishes to be 1,537,349 or 47.2 per cent of the total state population. It is quite clear that these six parishes now represent the most urban parts of Louisiana and may be used to contrast the patterns of education found in the most rural parts of the state.

In 1950, at least 75 per cent of the population in 29 of the 64 parishes was classed as rural.<sup>5</sup> In 1930 the total population of these 29 parishes was 523,115. By 1950 the population of these parishes was 536,066, representing one-fourth (24.9 per cent) of the total population of the state; in 1960 it was 569,113 and was down to less than one-fifth (17.5 per cent) of the state's population.

In 1930 only 16,040 or 3.1 per cent of the population of the 29 most rural parishes was classed as urban; 31.5 per cent was classed as rural-farm and 65.4 per cent was classed as rural-nonfarm. By the time of the

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<sup>5</sup>Ascension, Assumption, Avoyelles, Bienville, Caldwell, Cameron, Catahoula, DeSoto, Evangeline, Franklin, Grant, Iberville, Jackson, La Salle, Livingston, Plaquemines, Pointe Coupee, Red River, Richland, Sabine, St. Bernard, St. Helena, St. James, St. Martin, Tensas, Union, Vernon, West Carroll, West Feliciana.

1960 census, the urban population in these parishes had increased in number more than six fold, to 122,756 or 21.6 per cent of the total of the 29 parishes' population. The rural-farm population of these parishes, on the other hand, decreased during this 30-year period from 342,038 to 98,583, and represented less than one-fifth (17.3 per cent) of the population in 1960. The total loss in rural-farm population during the 30-year period was 243,455, or nearly three-fourths (71.2 per cent). Rural residents not on farms increased to 182,737 in 1960, a growth of 110.7 per cent.

The first significance for rural education to be found in these population trends becomes obvious at this point. Rural schools of the state are no longer primarily serving a particular occupational group, i.e., farmers. In fact, these schools now service approximately two nonfarm persons for every farm person. The implications for curricula and other school matters are inherent in the shift of the rural population from predominantly rural-farm to predominantly rural-nonfarm.

## White and Nonwhite Population Trends in Rural Areas

Although this study does not focus on Negroes, it provides a comparison of the growth of the two major racial segments of the state's population. It is noteworthy that nonwhites have been concentrated in rural areas of the state in the past — 40.9 per cent of this racial group being classified as rural in 1930. Only 33.2 per cent of the nonwhites of the state lived in rural places in 1960. In 1930, 36.9 per cent of the total population of the state was nonwhite as contrasted with 31.9 per cent in 1960. During the 30-year period included in this study, the number of both racial groups increased substantially. Nonwhites enlarged their numbers from 783,433 to 1,045,068, an increase of 261,635 or 33.4 per cent. The white population increased from 1,318,160 to 2,211,954, an increase of 893,794 or 67.8 per cent.

The increase of white and Negro population in Louisiana during the 30 years was not equally distributed among all areas of the state or within all population groups. For example, whites registered an increase of 749,377 or 95.1 per cent in the six parishes which were 75 per cent or more urban in 1950. The Negro population also increased in these urban centers but at a much slower rate, adding 120,838 persons for a 33.4 per cent increase. In the 29 parishes which had 75 per cent or more of their population classed as rural, the white population increased much less rapidly — by 47,804 (a 15.1 per cent jump). The Negro population actually decreased by 5,181 persons (2.0 per cent) during this 30-year period. Both these trends have implications for rural and urban education.



## School-Age Population Trends

In 1930 there were 506,356 people 7-17 years old in the state. These ages are included because they represent the ages at which children and youths are most likely to be in school. Of this number, 316,333 were white. (See Table 2.) By 1960 the number had increased some 223,552 persons to a total of 731,455, an increase of 44.1 per cent. Whites in these ages increased by 149,649 (47.3 per cent), compared with an increase of 73,903 (38.9 per cent) for Negroes.

The number of children 7-17 years old in the six most urban parishes of the state increased from 159,368 to 318,724 during the 30-year period, a jump of 159,356 or 100 per cent.

The 29 parishes with a population 75 per cent or more rural in 1950 had 140,351 people of ages 7-17 in 1930. By 1960 the school-age population had increased slightly to a total of 141,314, an increase of 963 during the 30 year period (.7 per cent).

A study of the above trend indicates clearly that rural schools have not experienced the pressure for buildings and other facilities that urban parishes have. In fact, it seems unrealistic to expect more than small increases in the school-age population in rural parishes in the foreseeable future.

## Trend in School Attendance

Normally a person would find an increase or decrease in the number of children of school age to be accompanied by a comparable increase or decrease in school attendance. For the state as a whole there was a great increase in the children 7-17 years of age enrolled in school from 1930 to 1960, from 407,914 to 688,336, which amounted to 68.7 per cent.

In 1930 the total enrollment of white children 7-17 years in school was 267,343. By 1960 the enrollment had increased to a total of 442,477 an increase of 65.5 per cent during the 30 years. Nonwhite enrollment advanced from 140,571 to 245,859, a rise of 74.9 per cent. The percentage of Negro children of school age in school in 1960 was for the first time almost the same as that of whites.

The number of children 7-17 years of age in the six most urban parishes in 1930 was 159,368, of which 129,354 or 81.2 per cent were enrolled in school. During the 30-year period between 1930 and 1960 the number of children of school-age in these parishes increased by 159,356, almost 100 per cent. The percentage of school age children enrolled in school in 1960 was 94.6 per cent, a jump of 13.4 percentage points in 30 years.

In the 29 most rural parishes, there was an increase in children enrolled in school from 1930 to 1960 comparable to that registered by

TABLE 2.—Changes in the Number of Persons 7-17 Years Old in Louisiana, 1930-1960, by Race and Most Urban and Most Rural Parishes

| Population Group<br>7-17 Years Old | 1930    | 1940    | 1950    | 1960    | Increase or Decrease<br>1930 - 1960 |          |
|------------------------------------|---------|---------|---------|---------|-------------------------------------|----------|
|                                    |         |         |         |         | Number                              | Per Cent |
| Total Population                   | 506,356 | 524,703 | 524,545 | 731,455 | 223,552                             | 44.1     |
| Whites                             | 316,333 | 328,161 | 328,685 | 465,982 | 149,649                             | 47.3     |
| Nonwhites                          | 190,023 | 196,542 | 195,860 | 263,926 | 73,903                              | 38.9     |
| 6 Most Urban Parishes*             | 159,368 | 171,901 | 188,895 | 318,724 | 159,356                             | 100.0    |
| 29 Most Rural Parishes*            | 140,351 | 140,254 | 126,215 | 141,314 | 963                                 | .7       |

\*Based on 17th Decennial Census

TABLE 3.—Changes in Number of Persons 7-17 Years Old Enrolled in School in Louisiana, 1930-1960, by Race and Most Urban and Most Rural Parishes

| Population Group<br>7-17 Years of Age<br>Enrolled in School | 1930    | 1940    | 1950    | 1960    | Increase or Decrease<br>1930 - 1960 |          |
|-------------------------------------------------------------|---------|---------|---------|---------|-------------------------------------|----------|
|                                                             |         |         |         |         | Number                              | Per Cent |
| Total Population Enrolled                                   | 407,914 | 440,346 | 471,810 | 688,336 | 280,422                             | 68.7     |
| Per Cent Enrolled                                           | 80.6    | 83.9    | 89.9    | 94.1    | ...                                 | ...      |
| White Population Enrolled                                   | 267,343 | 288,195 | 300,315 | 442,477 | 175,134                             | 65.5     |
| Per Cent Enrolled                                           | 84.5    | 87.8    | 91.4    | 94.9    | ...                                 | ...      |
| Nonwhite Population Enrolled                                | 140,571 | 152,151 | 171,495 | 245,859 | 105,288                             | 74.9     |
| Per Cent Enrolled                                           | 74.0    | 77.4    | 87.6    | 93.1    | ...                                 | ...      |
| Number Enrolled, 6 Most Urban Parishes*                     | 129,354 | 152,421 | 174,165 | 301,364 | 172,010                             | 133.0    |
| Per Cent Enrolled                                           | 81.2    | 88.7    | 92.2    | 94.6    | ...                                 | ...      |
| Number Enrolled, 29 Most Rural Parishes*                    | 111,703 | 116,349 | 112,795 | 133,618 | 21,915                              | 19.6     |
| Per Cent Enrolled                                           | 79.6    | 83.0    | 89.4    | 94.6    | ...                                 | ...      |

\*Based on 17th Decennial Census

the state as a whole. There was a relatively large increase of 21,915 children, which jumped the percentage of children 7-17 years of age in school to 94.6 per cent.

This amounted to an increase of 15 percentage points during the 30-year period. Thus it is apparent that the school age population has increased during these 30 years more rapidly in the most urban than in the most rural parishes, but the relative number of school-age children in school increased somewhat more rapidly in the rural parishes. In 1960 there was no difference between residence groups in the percentage enrolled in school.

## Teachers in Louisiana Public Schools

The general increase in the number of children enrolled in Louisiana schools was paralleled by an increase in the number of teachers to conduct these schools. In 1936-37 there were 13,525 public school teachers in the state, 9,860 of whom were white.<sup>6</sup> (Comparisons here cover the last 24 years, 1936-37 to 1960-61, and take advantage of the study previously mentioned. The 1961-62 data were not available when this study was initiated.) By 1960-61 the number had increased to 26,371, including 17,146 white public school teachers.<sup>7</sup> Thus, in the 24 years the number of public school teachers increased by 12,846 or 95 per cent. White public school teachers experienced a gain of 73.9 per cent, and Negro teachers of 115.7 per cent.

In the six most urban parishes there were 3,973 teachers employed in the public schools in 1936-37, of whom 2,935 were in the white schools. By 1960-61, the total number of teachers in these schools was 10,080. White teachers then numbered 6,329, a gain of 3,394 or 115.6 per cent. Negro teachers numbered 3,751, for a gain of 2,713 or 261.4 per cent. The rate of increase of students was less than that of teachers. (See two preceding topics.)

In the 29 most rural parishes of the state there were 4,088 teachers in 1936-37, of whom 3,010 were employed to teach the white children and 1,078 to teach the Negro children. By 1960-61 the number of teachers had increased to 5,754 (a 40.8 per cent increase). White schools added 751 teachers (25 per cent) and Negro schools, 915 teachers (84.9 per cent) during the 24 years. It can be readily seen that when measured by a pupil-teacher ratio, rural schools have improved in the last quarter century.

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<sup>6</sup>*Eighty-Eighth Annual Report for the Session 1936-37*, State Department of Education of Louisiana Bulletin No. 367, Vol. I, 1938, Table X. (All following data for this session are from this report.)

<sup>7</sup>*One Hundred Twelfth Annual Report for the 1960-61 Session*, State Department of Education of Louisiana Bulletin, No. 953, 1961, Table XV. (All following data for this session are from the report.)

The study of Louisiana rural schools made in 1936-37 enabled the researcher, Smith, to state, "The academic qualifications of the Louisiana teachers are high. Teachers in the small hamlet or open-country consolidated high schools uniformly possess higher academic training than is required by the Southern Association of Colleges and Secondary Schools of its accredited high school teachers."<sup>8</sup> During the quarter century since this study, the academic requirements of teachers throughout the nation have been raised until at present all states require that high school teachers must have a degree from an approved college, together with some professional training in the field of teaching. Many states require similar preparation for teaching in the elementary schools.<sup>9</sup> Louisiana now requires that elementary as well as secondary school teachers have completed not less than four years of training in an approved college together with a certain number of college hours of professional training in order to be fully certified. In cases where a qualified teacher cannot be found, a person who has not met the academic requirements may be employed on a temporary basis. Such teachers are given "T" certificates. Teachers who were in the school system when the standards were raised to their present level are allowed to continue to teach.

In 1936-37, 37.7 per cent of the public school teachers of the state held college degrees. Twenty-four years later, 92.4 per cent of the teachers and principals were college graduates. Only 44.4 per cent of the white teachers had a college degree in 1936-37; but 90 per cent of the white teachers and principals held degrees in 1960-61. In 1936-37, 19.7 per cent of the teachers of the public schools for Negro children had earned degrees from colleges. In 1960-61, 96.8 per cent of the Negro teachers and principals had earned degrees.

The training of the teachers in urban schools was somewhat higher than that of the rural schools throughout the period of study. In 1936-37 the percentage of teachers with degrees in the six most urban parishes of 1950 was 47.3. The percentage of white school teachers was 51.8 and the percentage of Negro school teachers was 34.7. By 1960-61, 93.6 per cent of the teachers and principals in these parishes had earned degrees, including 91.0 per cent of the white teachers and principals and 98.1 per cent of the Negro teachers and principals. In the 29 most rural parishes, where 30.5 per cent of all the teachers had degrees in 1936-37, the percentage of white teachers with degrees increased from 36.9 to 85.8 in 24 years. The percentage of Negro teachers with degrees jumped from 12.6 to 95.5 in the 29 parishes.

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<sup>8</sup>Smith, *op. cit.*, p. 88.

<sup>9</sup>Marion B. Smith, *Survey of Social Science*, 4th edition, (Boston, Houghton Mifflin Co., 1956) p. 188.



TABLE 4.—Trend in Professional Training of Public School Teachers in Louisiana by Race and Most Urban and Most Rural Parishes, 1936-37 and 1960-61 Sessions

| Residence and Race Group       | 1936-37 Session       |          |                          |               | 1960-61 Session       |          |                          |               |
|--------------------------------|-----------------------|----------|--------------------------|---------------|-----------------------|----------|--------------------------|---------------|
|                                | Teachers With Degrees |          | Total Number of Teachers | Ph.D or Ed. D | Teachers With Degrees |          | Total Number of Teachers | Ph.D or Ed. D |
|                                | Bachelor's            | Master's |                          |               | Bachelor's            | Master's |                          |               |
| <b>Louisiana</b>               | 4,531                 | 565      | 13,525                   | 0             | 19,564                | 6,030    | 27,726                   | 22            |
| Per Cent with Degrees          | .....                 | ....     | 37.7                     | .....         | .....                 | .....    | 92.4                     | .....         |
| White                          | 3,837                 | 536      | 9,860                    | 0             | 11,676                | 4,539    | 18,036                   | 21            |
| Per Cent with Degrees          | .....                 | ....     | 44.4                     | .....         | .....                 | .....    | 90.0                     | .....         |
| Nonwhite                       | 694                   | 29       | 3,665                    | 0             | 7,888                 | 1,491    | 9,690                    | 1             |
| Per Cent with Degrees          | .....                 | ....     | 19.7                     | .....         | .....                 | .....    | 96.8                     | .....         |
| <b>6 Most Urban Parishes*</b>  | 1,576                 | 304      | 3,973                    | 0             | 7,209                 | 2,605    | 10,493                   | 13            |
| Per Cent with Degrees          | .....                 | ....     | 47.3                     | .....         | .....                 | .....    | 93.6                     | .....         |
| White                          | 1,238                 | 282      | 2,935                    | 0             | 4,227                 | 1,772    | 6,603                    | 12            |
| Per Cent with Degrees          | .....                 | ....     | 51.8                     | .....         | .....                 | .....    | 91.0                     | .....         |
| Nonwhite                       | 338                   | 22       | 1,038                    | 0             | 2,982                 | 833      | 3,890                    | 1             |
| Per Cent with Degrees          | .....                 | ....     | 34.7                     | .....         | .....                 | .....    | 98.1                     | .....         |
| <b>29 Most Rural Parishes*</b> | 1,168                 | 80       | 4,090                    | 0             | 4,215                 | 1,212    | 6,092                    | 5             |
| Per Cent with Degrees          | .....                 | ....     | 30.5                     | .....         | .....                 | .....    | 89.1                     | .....         |
| White                          | 1,036                 | 76       | 3,013                    | 0             | 2,424                 | 987      | 3,982                    | 5             |
| Per Cent with Degrees          | .....                 | ....     | 36.9                     | .....         | .....                 | .....    | 85.8                     | .....         |
| Nonwhite                       | 132                   | 4        | 1,077                    | 0             | 1,791                 | 225      | 2,110                    | 0             |
| Per Cent with Degrees          | .....                 | ....     | 12.6                     | .....         | .....                 | .....    | 95.5                     | .....         |

\*Based on 17th Decennial Census

TABLE 5.—Trend in Teaching Experience of Public School Teachers in Louisiana by Race and Most Urban and Most Rural Parishes, 1936-37 Session and 1961-62 Session

| Residence<br>and<br>Race Group     | 1936-37 Session                                   |                                                            | 1960-61 Session                                            |                                                             |
|------------------------------------|---------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------|
|                                    | Per Cent Teachers<br>With 1 Year of<br>Experience | Per Cent Teachers<br>With 5 or More<br>Years of Experience | Per Cent Teachers<br>With 5 or More<br>Years of Experience | Per Cent Teachers<br>With 19 or More<br>Years of Experience |
| <b>Louisiana</b>                   |                                                   |                                                            |                                                            |                                                             |
| White                              | 11.0                                              | 66.6                                                       | 77.4                                                       | 31.3                                                        |
| Nonwhite                           | 11.3                                              | 67.1                                                       | 84.3                                                       | 34.9                                                        |
|                                    | 10.3                                              | 65.4                                                       | 75.0                                                       | 24.6                                                        |
| <b>6 Most Urban<br/>Parishes*</b>  |                                                   |                                                            |                                                            |                                                             |
| White                              | 11.1                                              | 70.7                                                       | 73.7                                                       | 26.8                                                        |
| Nonwhite                           | 11.3                                              | 69.0                                                       | 73.7                                                       | 28.8                                                        |
|                                    | 10.5                                              | 71.5                                                       | 76.3                                                       | 23.5                                                        |
| <b>29 Most Rural<br/>Parishes*</b> |                                                   |                                                            |                                                            |                                                             |
| White                              | 11.9                                              | 64.1                                                       | 83.8                                                       | 33.9                                                        |
| Nonwhite                           | 12.2                                              | 64.9                                                       | 84.4                                                       | 42.7                                                        |
|                                    | 11.0                                              | 62.0                                                       | 79.0                                                       | 25.5                                                        |

\*Based on 17th Decennial Census

Another factor to be considered in evaluating the qualifications of teachers is their experience in teaching and the security of their tenure. In 1936-37, of the public school teachers of the state as a whole, 11 per cent had taught only 1 year prior to the current year and 66.6 per cent had taught for 5 or more years. (See Table 5.) The teachers in elementary schools were more experienced on the whole than the high school teachers. The median number of years of experience for elementary school teachers was 6.3, while that for the high school teachers was 2 years less.

The experience of the white teachers was not great in 1936-37. One in 10 (11.3 per cent) had taught for only 1 year; while 67.1 per cent had taught for 5 or more years. Some 10.3 per cent of the Negro teachers had just 1 year of experience, while 65.4 per cent had 5 or more years of service.

In 1960-61 the teachers and principals were more experienced than at the earlier period. Only 5.8 per cent had just 1 year of experience and 31.3 per cent — almost one-third — had 19 or more years of experience. Over three-fourths (77.4 per cent) had taught at least 5 years. At this time all teachers of the state were protected by the Tenure Law which provided that no teacher, after a 3-year probationary period, could be removed from his position except for "cause." In 1960-61, 5.8 per cent of the white teachers and principals, and 6 per cent of the Negro teachers had only 1 year of experience, but 34.9 per cent of the former and 24.6 of the latter had 19 or more years experience. (See Table 5). Relatively more white teachers (84.3 per cent) than Negro teachers (75 per cent) had taught 5 years or more.

In the six most urban parishes, in 1936-37, 11.3 per cent of the white teachers had 1 year of experience; 69 per cent had 5 or more years experience. In 1960-61, 8 per cent had 1 year of experience or less and 73.7 per cent had 5 or more years experience, and 28.8 per cent had 19 or more years of experience. Among urban Negro teachers, in 1936-37, 1 in 10 (10.5 per cent) had only 1 year of experience, but 71.5 per cent had 5 or more years of work behind them. One-quarter century later, only 6.4 per cent of the urban Negro teachers had just 1 year of experience, while 76.3 per cent had 5 or more years experience, and 23.5 per cent had been teaching at least 19 years.

Of the teachers in the 29 most rural parishes in 1936-37, 11.9 per cent had one year of experience and 64.1 per cent had 5 or more years of experience. In 1960-61, 3.7 per cent of the teachers in these parishes had just 1 year of experience and 83.8 per cent had 5 or more years of experience. White and Negro comparisons show that 12.2 per cent of the whites, as compared with 11 per cent of the Negroes, had 1 year of experience in 1936-37, and 64.9 per cent of the former, as

compared with 62 per cent of the latter, had 5 or more years experience. In 1960-61, 3.4 per cent of the whites and 5.2 per cent of the Negro teachers had just 1 year of teaching, but 84.4 per cent of the white teachers and 79.0 per cent of the Negro teachers of these parishes had as many as 5 years of service.

It may be noted that the teachers in the urban parishes were more experienced than the teachers in rural parishes when the 1936-37 survey was made. Just the reverse was true in 1960-61. However, the teachers in both urban and rural parishes had more experience in 1960-61 than at the earlier period.

## Size of Louisiana Public Schools

A characteristic of rural schools throughout the United States has been that they are smaller than the schools in cities and towns.<sup>10</sup> The rural schools of Louisiana have been no exception. During the present century there has been a great effort made to increase the size of rural schools in the state. In 1910, there were 1,559 one-teacher schools in the state. By 1936-37, this number had been reduced to 225.<sup>11</sup> According to the Louisiana School Directory for the session 1960-61, there were only 13 one-teacher public schools in the entire state at that time, with an enrollment of 275 pupils. Of these, 8 were located in urban places, 6 in New Orleans and 2 in Alexandria, to serve special cases such as polio victims, crippled children, and the like. In 1959-60, the ratio of one-teacher schools to all public schools was .7 per cent in Louisiana as compared with an average of 17.2 per cent for the nation.<sup>12</sup>

There were, in 1960-61, 41 schools in the state with fewer than 50 students (all elementary). Twenty-one of these were white and 20 were nonwhite. It can be seen that the small school is vanishing in the state. In fact, the number of public schools operated by the state dropped from 2,349 in 1947-48 to 1,402 in 1960-61. While data for individual parishes were not available, it can be deduced from statistics on transportation that the number of rural schools has decreased rather drastically. In 1948-49, two out of every five (40.6 per cent) of the public school students were transported to the school via public vehicles. Twelve years later, 1960-61, the portion transported was up to one-half (50.9 per cent).<sup>13</sup>

<sup>10</sup>Mary Anne Harvey, "Statistics of Rural Schools: A U. S. Summary," *Circular Number 565*, U. S. Department of Health, Education, and Welfare, Washington, D. C., 1959. Walter H. Gaumnitz, "Small Schools are Growing Larger," *Circular Number 601*, U. S. Department of Health, Education, and Welfare, Washington, D. C., 1959.

<sup>11</sup>Smith, *Sociological Analysis of Rural Education in Louisiana*, p. 30.

<sup>12</sup>Know Your Louisiana Schools, Louisiana State Department of Education Bulletin No. 964, 1962, p. 24.

<sup>13</sup>*Ibid.*



At the same time, the average size of public schools increased from 180 to 506 students. It is a fact that Louisiana public schools are no longer small since 96.1 per cent of all pupils were registered in schools enrolling 200 or more students in 1960-61.

## Curriculum of Louisiana Rural Schools

Gaumnitz defines rural education as "that part of American education located in areas lying outside of the urban centers or places having 2,500 or more inhabitants." He goes on to say, "Rural education, however, has distinctive characteristics other than that relating to geographic location. It is concerned disproportionately with those phases of education that deal with the conditions, opportunities, and problems peculiar to people living upon dispersed farmsteads, or in hamlets of less than 2,500 population; the act or art of developing and cultivating through education the various physical, intellectual, aesthetic and moral faculties and the economic and social welfare of persons living in rural communities and the organized body of knowledge and theory dealing with principles and practices of learning and teaching in rural communities."<sup>14</sup>

If the above definition of rural education is accepted, one would expect the curricula of rural high schools to differ somewhat from those of urban high schools. In the conclusions of the study of rural schools made in Louisiana in 1936-37, however, the following statement is found: "The rural schools fail to recognize themselves as rural where their course of study is concerned. The same urban commercial, or 'cultural' subject matter found in urban high schools is characteristic of the small rural high school."<sup>15</sup> The same curriculum pattern seems to exist in Louisiana schools today, although students have a considerably richer program of education.<sup>16</sup> No formal program for adapting curricula to the local conditions or particular needs of students is in effect, although a range of "enrichment" and vocational subjects may be elected. From personal acquaintance, the writers are aware that Department of Education officials appreciate the peculiar problems of schools in certain communities and they counsel the students accordingly in each instance. In comparing rural and urban schools, the problem of the former is their generally smaller size which prevents them from offering as wide a selection of vocational and "enrichment" courses. The rural school also has the additional problem of preparing part of its student body for farm or rural occupations, and

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<sup>14</sup>Gaumnitz, *op. cit.*, p. 2.

<sup>15</sup>Smith, *A Sociological Analysis of Rural Education in Louisiana*, p. 89.

<sup>16</sup>Know Your Louisiana Schools, *op. cit.*, pp. 46-52.

part for urban occupations, since most rural youths now migrate to urban places.

## **A Case Study of Rural Schools**

As was stated in the introduction, a survey was made in 1959 of a sample of rural schools in two parishes, one located in a typical non-French culture area and one in a French culture area of the state. Through the cooperation of the parish superintendents and school officials of these parishes, four open country and hamlet schools were sampled in each parish along with the major high school located in the parish seat. In this way, it was possible to compare the students attending the most rural schools with those attending the most urban schools within the same culture area. Neither of the parish seats was highly urban. Marksville, the parish seat of Avoyelles, included 4,257 people and Winnsboro, the parish seat of Franklin Parish, had 4,437 people in 1960.

Each of the schools selected for the study was visited by the authors and some graduate students of the Departments of Sociology and Rural Sociology of Louisiana State University. Members of the 11th and 12th grades of each sample school were asked to fill out a questionnaire prepared for the study. An analysis of the responses of the students to certain items on the questionnaire follows.

### **Residence of Students**

The school children attending the sample rural schools were all rural dwellers. In Avoyelles Parish, 52 per cent of these students reported they lived in open country but not on a farm, and 37 per cent lived in population centers of less than 2,500 people and were also classed as rural dwellers. In Franklin Parish, 74 per cent of the school children from the sample rural schools lived on farms, 10 per cent lived in small population centers, and 16 per cent lived in the open country but not on farms.

Of the children attending the urban schools in the two parish seats, 48 per cent in Avoyelles Parish and 52 per cent in Franklin Parish were determined to have an urban residence, whereas 27 and 37 per cent were classed as rural-farm, respectively. Altogether about half of the children attending the schools located in these urban centers came from rural homes.

### **How Students Travelled to School**

The consolidation of schools in Louisiana has necessitated the development of a system of public transportation for school children by means of school buses. In Avoyelles Parish, 56 per cent of the students

of the four sample rural schools reported that they reached school by bus. In Franklin Parish, 82 per cent of the students in the rural schools rode a bus. It is in keeping with the close settlement patterns in Avoyelles that one-third (32 per cent) of the junior and senior students in the sample schools walked to school each day. Only 9 per cent of the students in the Franklin Parish sample rural schools walked. The remaining students in both parishes used private means of transportation.

Of the students attending the Marksville High School, 59 per cent rode the school bus, 21 per cent walked and 20 per cent reached school by private vehicle. Some 41 per cent of the Winnsboro High School juniors and seniors rode the school bus, 43 per cent used private transportation, and 16 per cent walked to school.

### **Distance Students Travelled to School**

In Avoyelles Parish the students attending the four rural schools lived near the schools. Almost 3 out of 10 (29 per cent) stated that they lived less than a half mile from the school, one-fifth (21 per cent) lived from one-half mile to 1 mile away, 15 per cent lived from 1 to 2 miles away, and 21 per cent lived farther than 4 miles from their schools. In the Franklin Parish rural schools, only 11 per cent of the students lived within one-half mile of the school, 11 per cent lived one-half to 1 mile away, 12 per cent lived 1 to 2 miles, 14 per cent lived 3 to 4 miles from school and 52 per cent had to travel more than 4 miles to get to school. Interestingly, 11 per cent of these juniors and seniors had to come a distance of 11 to 25 miles to reach their school each day.

The young people who attended the Marksville High School travelled a shorter average distance to reach school than the students who were in the Winnsboro High School. Almost half of the Marksville students reported that they lived within a mile of the school (45 per cent), 20 per cent lived within 2 miles, 13 per cent within 4 miles, 9 per cent within 6 miles, 10 per cent 7 to 10 miles, and only 2 per cent of the students lived more than 10 miles from the school they attended. Of the Winnsboro students, only 18 per cent lived within a mile of the school,<sup>17</sup> 13 per cent lived a mile to 2 miles, 17 per cent lived 3 to 4 miles, 10 per cent travelled 5 to 6 miles and 10 per cent went 7 to 10 miles to reach their school. About two-thirds of the Marksville students travelled no more than 2 miles to reach their school. If we assume that the students of Winnsboro High who did not answer the question as to the distance travelled, were dwellers in town, slightly less than two-thirds of the students there travelled less than 2 miles.

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<sup>17</sup>It should be noted that 33 per cent of the Winnsboro students did not state how far they lived from school. It may be assumed that they were the town students who did not live far from the school and, therefore, did not estimate the distance.

## The Vocational Plans of Students

The study of rural schools in Louisiana made in 1936-37 determined that 19.6 per cent of all the elementary school pupils attending town or rural consolidated schools expected to remain in the country. Among high school students the percentage expecting to live out their life in rural areas had fallen to 10.4 per cent; and among those students who had reached the senior year of high school, only 6.0 per cent expected to remain in this kind of environment.<sup>18</sup> The two explanations for this phenomenon offered were that pupils who desire to remain in the country either did not continue in school; or as they climbed the educational ladder, their desire to remain in the country was changed.

The students questioned in Avoyelles and Franklin parishes likewise did not expect to be farmers. In reply to the questions, "What job do you hope to make your life's work," only 5 per cent of the boys from the rural sample schools expected to be farmers, while 6 per cent of the boys from the Marksville High School aspired to this occupation. Not a boy among the juniors and seniors questioned in the Winnsboro High School indicated that they wanted to be farmers. It is interesting to note, however, that of the boys who had dropped out of school, 19 per cent indicated that they wanted to be farmers.

## Plans for Further Education

The question was asked of the student in the sample schools, "Do you plan further education or training?" In reply, 60 per cent of the boys in the rural sample schools and 73 per cent of the girls in these schools said, "Yes." Of the town students, 76 per cent of the boys from Marksville and 68 per cent of those from Winnsboro said, "Yes," while 67 per cent of the girls from Marksville, and 75 per cent of the girls from Winnsboro answered in the affirmative. These findings indicate a considerably higher percentage of the boys from the town schools planned to continue their education beyond high school than was true of the boys in rural schools, approximately 72 per cent as compared with 60 per cent. In contrast approximately the same percentage of rural and urban girls indicated plans to continue their education — 73 and 72 per cent, respectively. It may also be noted that a higher percentage of girls than of boys indicated plans to continue their education beyond high school.

The tabulations of responses to questions on what their post-high school educational plans included showed that approximately 33 per cent of the girls from rural schools wanted to study in a trade school or business college and not a liberal arts or a professional college or

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<sup>18</sup>Smith, *A Sociological Analysis of Rural Education in Louisiana*, pp. 68-69.



university. A smaller percentage of the town girls indicated a desire to continue their education in a trade school or business college — 26.1 per cent. Of the boys, only 8.1 per cent from rural schools and 8.5 per cent from town schools indicated a desire to continue their education in a trade school or business college. The percentage of town school girls indicating a desire to go to college was higher than that of the country school girls, 35.7 per cent compared with 26.1 per cent. The percentage of urban boys expressing plans to go to college was also higher than that of the rural boys, 55.0 per cent compared with 37.0 per cent.

## **The School as a Community Center**

Throughout the early history of our American society the rural school played an important part in community life. There the citizens would gather for recreation, for discussion of civic problems, and for consideration of the problems associated with the operation of the school. Through the rural school the people were drawn into close interaction. There is some question today whether or not schools are continuing to serve this function. For this reason, all students were asked to indicate how often their parents attended school functions.

In the study of rural schools in Louisiana made in 1936, this conclusion was drawn: "There is very little evidence to support the idea that the rural school, as an established institution, feels any responsibility to the community in which it is located. Not a high school reported any form of community activity functioning in the school except the P. T. A."

In Avoyelles and Franklin parishes in 1959, about 25 per cent of the students in rural schools reported that their parents attended athletic activities of the school frequently, while 75 per cent said their parents only "occasionally" or "never" attended school activities. About 35 per cent of the students attending the urban schools said their parents attended these functions. It must be kept in mind of course, that the town schools included many students brought in from rural areas. Less than half of the students from rural schools said their parents attended plays, musical events and other such school activities with regularity. Only one school of the 10 studied reported having a Parent-Teacher Association.











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